PROPOSAL

In Response to
Request for Proposals

Consultant Services for Economic Forecasting Data

Prepared for:

Government Finance Committee
The North Dakota Legislative Management

Submitted by:

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November 18, 2021

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TRANSMITTAL LETTER

November 18, 2021

Senator Ray Holmberg
Chairman
North Dakota Legislative Management
State Capitol
600 East Boulevard Avenue
Bismarck, ND 58505-0360

SUBJECT: Proposal for Consultant Services for Economic Forecasting Data

Dear Chairman Holmberg:

Thank you for the opportunity to contribute our proposal for above-referenced services necessary to support the North Dakota legislature's budgeting and revenue forecasting processes. The following provides the IHS Markit company profile, our understanding of your requirements for economic forecasting services. We have also provided a description of our key assets relevant to delivery of these services, our technical approach to the requisite modeling, key project staff and a list of relevant project qualifications and client references (including previous projects for NDLM).

For many years, IHS Markit has supported our state and local government clients' ability to manage to desirable fiscal outcomes through our system of rigorous models and hands-on expertise in simulating fiscal scenarios. Our economists regularly support our revenue estimating clients with forecasts, including preparation of independent revenue estimates utilized for budget preparation and policy evaluation. We frequently contribute budget hearing testimony to help policymakers understand the local, national, and global economic dynamics that drive the state economy and revenues.

As a strategic partner to revenue forecasting stakeholders at all levels of government, IHS Markit brings the economic foresight and hands-on public sector experience to help clients validate and strengthen the foundation for their own revenue estimates. IHS Markit aims to enhance our clients' own economic analysis – not simply through spreadsheets and tables; to the contrary, a successful forecasting relationship is based on open dialog with our client stakeholders in the shared pursuit of clarity, so all are able deliver on their goals and mission.

Thank you for your consideration.

Regards,

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BACKGROUND AND EXPERIENCE OF IHS MARKIT

Business Profile

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PROJECT UNDERSTANDING

The contract term is a base term concluding June 30, 2022 plus one extension option period commencing July 14, 2023 through June 30, 2025.

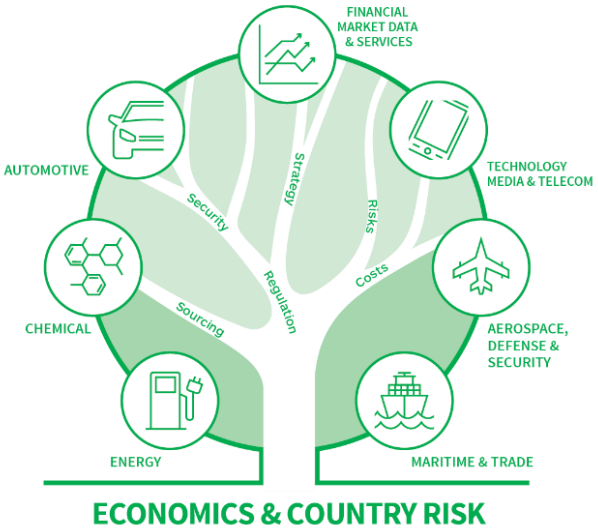
IHS Markit is eager to support North Dakota Legislative Management (NDLM) and the Government Finance Committee with its research and forecasting requirements necessary to fulfill its mission for fiscal stewardship and fact-based policy development. Our team of economists and analysts is systematically tracking the North Dakota, US and global economy and we work with our clients daily to help them understand how shifting economic dynamics impact governments, businesses and financial institutions As the largest and most consistently accurate commercial forecasting business in the world, IHS Markit is well-positioned from a staffing and data resources perspective to meet the requirements within the Request for Proposal (RFP), all while striving to exceed the expectations of our clients, which include fiscal stakeholders and budget analysts in over 40 states.

IHS MARKIT BUSINESS BACKGROUND

Every day, people in business, finance and government make decisions with wide-ranging implications. These leaders need to see the big picture and the interconnected factors that impact their organizations and their mission. Rigorous analytics that yield unique insights allows them to make the best decisions and stay ahead of the trend. At IHS Markit, we call this The New Intelligence.

IHS Markit is a leading source of information, insight and advisory services in the pivotal areas that shape today's business and policy landscape: economics, financial markets, energy, manufacturing, chemicals, technology, retail, logistics and transportation, healthcare, geopolitical risk, sustainability, and supply chain management. Governments around the globe rely on the expert independent analysis of IHS Markit to make high impact decisions and create strategies with speed and confidence. We combine leading economic, industry and geographic insight with client stakeholder input to help shape unique strategies and solutions for our clients. By uniting the world's largest private database of economic and industry information with unrivaled technical expertise, IHS Markit industry specialists and economists create actionable solutions based rooted in the realities that shape local, regional, and global economies.

IHS was founded in 1959 and became a publicly traded company on the New York Stock Exchange in 2005. In July 2016, IHS entered a merger of equals with global information leader Markit to create a new company, IHS Markit (NYSE: INFO). The combined company employs more than 14,000 people around the world.



IHS Markit currently serves:

- All G-20 governments
- 50,000 customers in over 140 countries
- 85% of the Fortune Global 500
- 75% of the Fortune Global 1000
- 94 of the 100 largest U.S. corporations
- 49 out of 50 largest U.S. banks

Our **Economics and Company Risk** (ECR) group cuts across all industry verticals, using our expertise to prepare economic analysis and forecasts through systematic coverage of the global economy and comprehensive consulting services. At the same time, ECR economic analysis and forecasts sets the foundation for the sector specific analysis used by IHS Markit industry specialists to provide real-time and forward-looking guidance to our clients.

Nearly all these business lines operate under IHS Global Inc., an independent US subsidiary headquartered in Englewood, CO.

A Deep History in Economic Analysis & Forecasting

Through predecessor companies such as Global Insight, DRI, and Wharton Econometric Forecasting Associates, IHS Markit founded the modern economic forecasting industry over 50 years ago. A leader in modeling and forecasting, IHS Markit has combined its economic analysis capabilities with the deep experience and rich analytics of our industry sector experts to provide unparalleled coverage and insight of the global economy.

Our Experts

The Economics & Country Risk team of over 300 economists, analysts and consultants serve as valuable extensions of our client organizations' staff – trusted advisors to executive management

and policymakers alike. Our customers are engaged daily with our economists and industry specialists to get a clear and comprehensive understanding of our analysis and forecasts.

Consulting Services
We advise on specific issues that affect competitive position, investment strategy and policy development by:

- Investigating global, regional, and local economic dynamics
- Identifying the market forces that will shape economic growth and business performance
- Providing clear, reasoned recommendations to help guide opportunity and mitigate risk

TAX FORECASTING EXPERTISE & KEY FORECASTING ASSETS

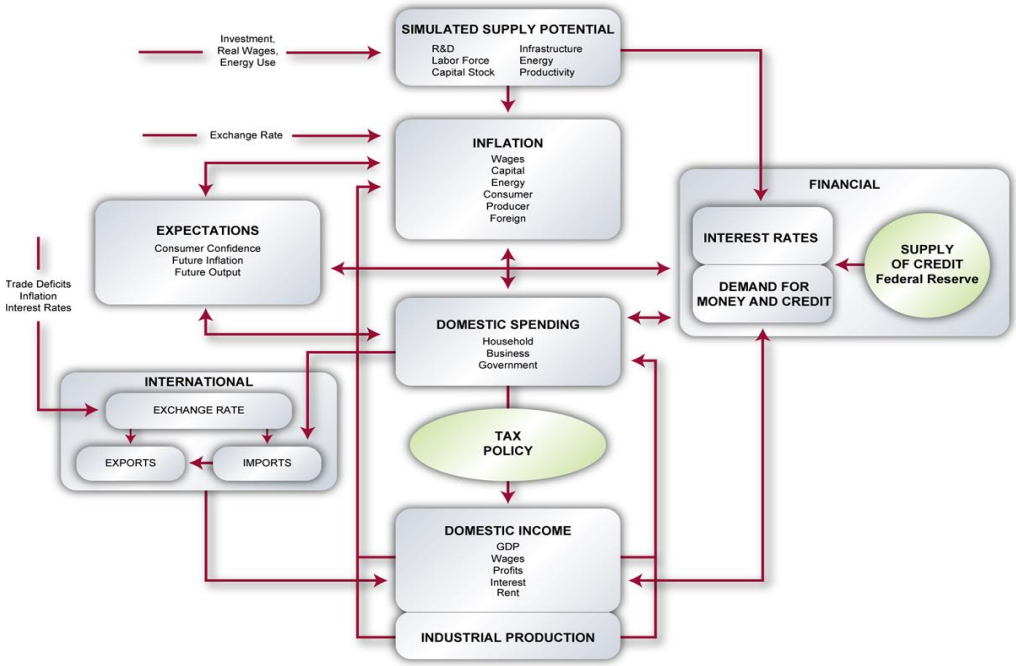
State economies are constantly evolving with changes in economic structure, industry mix, demographics, public policy, and unforeseen economic shocks that ultimately shape government revenue flows. However, as regional economies become increasingly intertwined, events previously thought of as irrelevant or far-flung can now have direct local impact. Everything from tariffs to evolving consumer behavior to shifting import patterns can influence state government revenues. For example, softening economic growth in key Asian economies may weaken export demand for producers in your area. Fluctuating exchange rates and new tariffs may curtail the ability of local firms to respond to export demand or capitalize on strong consumer spending.

Bottom line? Basic trend models that take a simplified, one-dimensional view of local economic activity without holistically incorporating local, national, and global drivers are often deficient for reliably predicting government revenues.

As a strategic partner to state fiscal leaders, we work with our clients to quantify how economic and policy changes impact their state's capacity to plan, budget and deliver vital public services. Every day we work closely with state legislative leaders, state budget officers and revenue forecasters to inform their revenue estimating and budget process by providing independent forecasts of tax and non-tax revenues that help fiscal planning stakeholders achieve better rigor, consensus and outcomes. We develop our custom tax revenue forecasting models by deriving statistical relationships between changes in the levels of specific tax revenue streams (e.g., personal and corporate income taxes, sales and use taxes, etc.) and trends in the key economic drivers that generate the revenues.

IHS Markit Model of the US Economy
The IHS Markit's Model is an econometric dynamic equilibrium growth model. It strives to incorporate the best insights of many theoretical approaches to the business cycle: Keynesian, neoclassical, monetarist, supply-side, and rational expectations. In addition, the IHS Markit's Model embodies the major properties of the long-term growth models presented by James Tobin, Robert Solow, Edmund Phelps, and others. This structure guarantees that short-run cyclical developments will converge to robust long-run equilibria.

In growth models, the expansion rate of technical progress, the labor force, and the capital stock determine the productive potential of an economy. Both technical progress and the capital stock are governed by investment, which in turn must be in balance with post-tax capital costs, available savings, and the capacity requirements of current spending. As a result, monetary and fiscal policies will influence both the short- and the long-term characteristics of such an economy through their impacts on national saving and investment.



IHS Markit's Model for the North Dakota and US State Economies

IHS Markit maintains behavioral econometric models for each of the 50 US states. The state models are dynamic econometric models of competition and growth, and provide a detailed specification and generate forecasts of demographic and macroeconomic concepts including population cohorts, labor force and unemployment, employment by NAICS classification, GSP by NAICS sectors, average wage by NAICS sectors, personal income details, housing markets, retails sales, etc. Structural details of inter-industry purchasing relationships are integrated into the industry sectors of each model.

IHS Markit's State Econometric Models are linked to Quarterly Model of the US Economy, incorporating national demands for goods and services as drivers of economic activity within a state. The influence of the national economy is shaped by state-specific conditions of industry mix; relative cost structures, demographics, and income/expenditure patterns. A state's evolving competitive strengths and weaknesses determine its success in capturing a share of the national market by industry sector.

The basic objective is to project how state economic activity varies, given an economic environment as laid out by IHS Markit's US Macroeconomic and US Industry forecasts. Analyst input is an important factor in finalizing the forecast. IHS Markit has a dedicated analyst for each state and metro area, and these analysts are well informed and educated about local developments and how those should affect the outlook for the region. The econometric models provide an initial forecast solution determined by national economic and state-specific drivers; the analysts' judgment incorporates refinements to the forecast due to any expected changes that may have not been captured in the behavioral relationship formulated in the model.

The IHS Markit's US Regional Model provides analyses of each state and metropolitan area in the US, including county level models. Each area is modeled individually and then linked into a national system of macroeconomic and industry forecasts. The models forecast internal growth

dynamics and differential business cycle responses for each state. Our objective is to forecast how regional activity varies, given an economic environment as laid out by IHS Markit's US economic and industry models. To do this, the model must be able to explain two key phenomena:

- Why states react differently from one another over the business cycle.
- Why states grow or decline relative to each other over the longer run.

These issues are addressed using information about detailed industrial mix, inter-industry and inter-regional relationships, productivity and relative costs, and migration trends. In addition, the models are policy sensitive, and respond to changes in tax rates, Federal transfer payments, etc.

TAX FORECASTING METHODOLOGY

The IHS Markit approach to tax model development is based on sound, defensible econometric methods that reflect best practices for the discipline of forecasting. We stress the importance of employing a rigorous set of local tax data coupled with appropriate economic indicators for the state from the Bureau of Labor Statistics and the Bureau of Economic Analysis. The base data are then linked to IHS Markit proprietary forecasts for North Dakota (and our extended forecasting system for industry sectors and regions) to achieve a forward view of North Dakota tax revenue.

For each Tax Model variable, IHS Markit develops, using best econometric practice, an explanatory equation capable of use as a forecast equation with our economic and demographic forecasts as inputs. All standard statistical regression test statistics and results will be made available to the client. Model (equation) selection will be determined on a case-by-case basis for each tax component. The functional form will generally be logarithmic, or log-difference. Explanatory variables, and their estimated coefficients, will be consistent with economic theory.

Our standard practice for our tax revenue estimating clients is to develop a set of econometric equations for inclusion in a model to forecast all relevant tax revenue streams, such as sales and use taxes by sector, personal or individual income taxes on wages and non-wage income, corporate income taxes, excise taxes, and property taxes. Model equations are constructed to use our proprietary economic and demographic forecasts as inputs. These include variables such as wage and salary disbursements, personal income, retail sales, consumer expenditures by type of good or service including motor vehicles, unemployment rate, value added by sector, output, population change, and home prices. We use our econometric expertise to estimate statistically significant equations, unique to each jurisdiction and tax type being considered, that explain tax revenue levels over time based on the trends and variation in the economic variables. Similar approaches are also deployed to forecast receipts from non-tax sources such as license fees, room charges, user fees, and tolls on transportation infrastructure.

One major IHS Markit competitive advantage in forecasting state and local government revenues is that we already have econometric forecasting models for states with historical and forecast values for all the major economic and demographic variables that drive government revenues. We can then develop and link a module that explains the econometric relationships between tax collections and changes in economic activity.

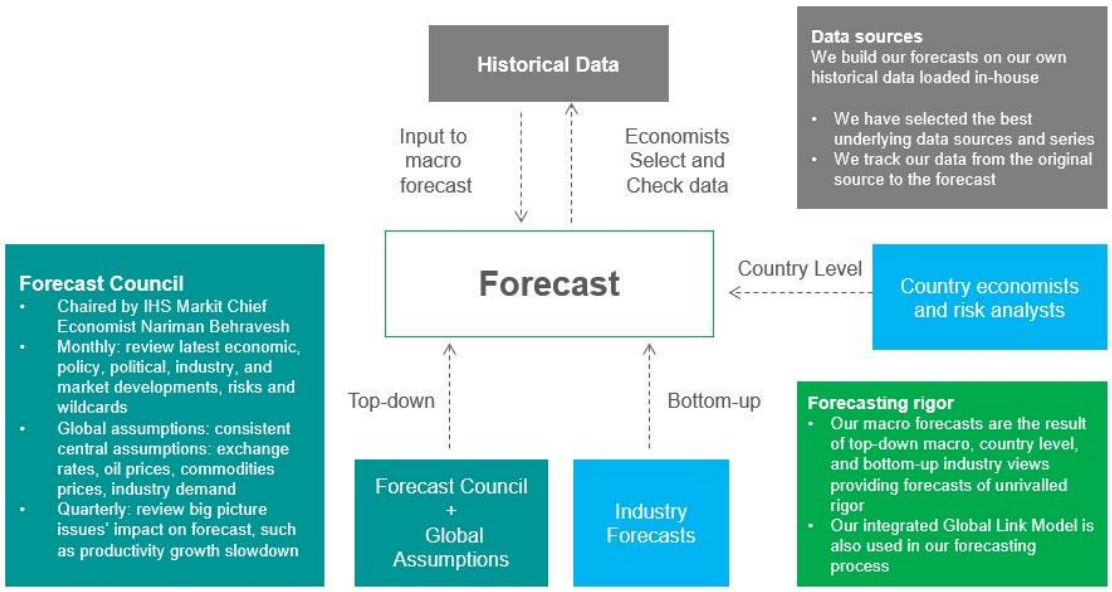
Another advantage is that we use a top-down approach in developing our state forecasts. As a result, key variables from our current energy, industry, US macroeconomic, and global economic forecasts are automatically considered in the state forecast.

A third key advantage of IHS Markit forecasts is our ability to leverage IHS Markit's vast array of industry experts who regularly contribute to our revenue forecasting process. A few major industries will often be the dominate contributors to state revenues and statewide economic activity. In North Dakota, for example, that could mean leveraging IHS Markit agriculture experts to assess the prospects for grain demand and food processing; and our economists focused on assessing retail spending trends for consumer-packaged goods at big box stores; and our automotive specialists forecasting component demand from the automotive industry; and our upstream oil analysts tracking crude prices to assess the well-head economics of the Bakken formation. Beyond our economic expertise, IHS Markit's industry experts play a crucial role in providing context on the industries that shape tax revenue flows.

Our state econometric forecasting models already contain multiple variables that are essential to forecasting different types of tax revenues, including: total personal income, wage and salary payments by 2-digit NAICs code, two categories of retail sales, new passenger and light truck vehicle registrations, 21 types of personal consumption expenditures, the CPI, state and local personal tax payments, shipments of manufactured goods and industrial production. The models also contain, as applicable in an individual state, current tax rates for nine types of major state-level taxes.

Our state forecasting models are designed, along with the proprietary software used to run them (EViews), with the ability to modify and compare the revenue effects of alternative tax policies such as different rates, types of goods and services subject to a tax, as well as alternative economic growth scenarios.

Our methodology for forecasting government revenues is shown in the flow chart presented below. The figure clearly shows how we leverage all our information and forecasting assets to derive government revenue estimates that are driven by levels of economic activity at the regional, state, US, and global levels.



PROPOSED SCOPE OF WORK

IHS Markit proposes to utilize our existing US Macroeconomic (Task 1) and US Regional (Task 2) modeling infrastructure to meet the Legislative Management's economic forecasting requirements. The advantage of having this existing capital to perform the economic forecasting and analysis means that IHS Markit is immediately ready to begin the more detailed work on behalf of the State tax revenue models. Having the existing capital in place also enables IHS Markit to minimize the development cost associated with re-estimating the existing models developed under previous engagements with NDLM. These time-tested models have earned us the reputation as being the most consistently accurate economic forecasting firm in the world (more about IHS Markit experience with economic forecasting can be found on Page 6 of this proposal).

To forecast the tax revenues for North Dakota (Task 2c), IHS proposes to develop an econometric model for the total taxes received by the State, as well as the significant sources of those revenues, including automobile sales, food services, and building materials, which represent approximately one-third of the sales tax base. Dis-aggregation of the sales tax base components will enable us to more accurately trace and forecast the revenue stream given their disparate economic drivers.

For industry-specific forecasts in North Dakota, such as those related to agriculture-related commodity prices and production values (Task 2d), or oil production (Task 2e), IHS Markit will also leverage our existing information and intelligence from our IHS Markit Agriculture and IHS Markit Energy teams, respectively.

As has been our standard practice, IHS Markit will host an initial kick-off meeting to make team introductions and review our understanding of the project and the project team will hold regularly scheduled meetings with the appropriate members of the Legislative Management and the Government Finance Committee who are interested in the format and content of the final qualitative (and quantitative) deliverables.

A draft report explaining the fundamental national and local economic conditions and forecasts driving tax revenues will be prepared and provided to the Legislative Management and the Government Finance Committee for review before the final report. The first complete and final report is to be delivered no later than Friday, September 30, 2022; a second updated report due January 13, 2023; and a third report due Friday, March 24, 2023.

IHS Markit first draft and final reports will be delivered in either Microsoft Word or Adobe PDF format, based on Legislative Management and the Government Finance Committee's preference, and supporting data will be delivered in Microsoft Excel spreadsheet format, and presentations will be delivered in Microsoft PowerPoint format. In addition, IHS Markit will be available to present these findings to the Legislative Revenue Advisory Committee, Government Finance Committee and the Appropriations Committees of the 68th Legislative Assembly if desired.

Report Component 1 – General Economic Forecasting Data related to the National Economy

IHS Markit US Macroeconomic model provides our clients with the most comprehensive examination of the US economy, with a complete short-term (10-year) and long-term (30-year) forecast and analysis of all sectors of the economy.

Our short-term forecast includes our full monthly ten-year forecast, including alternative scenarios and risks, analysis of all sectors of the economy, the global context, and access to IHS superior team of US macro and industry economists. Our long-term forecast provides clients with analysis and 30-year forecasts on the structure of the US economy in four scenarios: Trend, Cyclical, Optimistic, and Pessimistic. IHS Markit's 30-year projections cover the standard macro concepts such as output, inflation, and unemployment, but also the more disaggregate variables, such as production and employment by industry.

The economic analysis and data compiled for this section of the standard periodic report will include, but will certainly not be limited to, the following information:

- Projected interest rates through calendar year 2025;
- Projected West Texas Intermediate oil prices though calendar year 2025
- Recent trends and projections in the value of the US Dollar
- An outlook for major economic sectors through calendar year 2025 (short-term outlook);
- An outlook for major economic sectors through calendar year 2029 (long-term outlook);
- Upside and downside risks to the national economy.

Report Component 2– Detailed Economic Forecasting Data Specific to North Dakota's Economy

Tasks 2a-2b. Recent trends in the state's major economic sectors or major industries & key economic assumptions

The IHS Markit US Regional model provides clients with economic coverage of all 50 states & DC, all metro areas & divisions, and all counties. Our US Regional forecasts are all completed in conjunction with IHS Markit US Economic, Industry, and Country Intelligence groups to allow for a comprehensive, rigorous look at trends and developments at the global, national and local level. In addition to superior medium and long-term forecasting, IHS Markit US Regional group provides clients with short-term analysis of key economic and industry developments in each state and metro we cover to enable clients to stay well informed of changes in each areas business climate. Our short-term analysis includes monthly employment forecast updates at the states level along with analysis of key US data releases and monthly updates of key business trends.

IHS Markit will utilize its state econometric model for North Dakota to highlight the ongoing trends and developments within the state's economy. The supporting data and analysis will cover:

- Recent trends in the state's major economic sectors or major industries since calendar year 2017;
- Key economic assumptions underpinning the forecast of statewide economic growth, particularly the assumptions related to economic activity the oil and gas industry and the agriculture industry.

Task 2c. State tax collections

Using the technical approach to tax forecasting described earlier in this proposal, IHS Markit will utilize the tax models previously developed for NDLM.

Ideally, a first step would be in collecting monthly tax revenue data (consisting of sales and use tax collections, motor vehicle excise tax collections, individual income tax collections and corporate income tax collections), as compiled by the State. IHS will work to 'clean' this dataset by explicitly adjusting for any known anomalies (such as those due to unusual processing activity), which are unrelated to observable economic events. The data will be converted to a quarterly frequency. This both smooths some of the underlying monthly variation, and results in a data base conformable to available economic variables. On a case-by-case basis we will determine whether seasonal adjustment is appropriate. Generally, this will depend on the nature of the collection stream, and on the structure of the explanatory economic variables. IHS will use its own extensive data set of economic variables as the historical base upon which the explanatory equations will be developed.

The Tax Models, coupled with our forecast of the macroeconomic and North Dakota economy and buffeted by an overview of economic activity for the US, oil, gas and agricultural commodities, and the regional economy, will include variables such as wage and salary disbursements, personal income, retail sales, consumer expenditures by type including motor vehicles, corporate profits, the unemployment rate, population change, and home prices, will be used to project the tax revenues of the State over the course of current and future fiscal years.

For the baseline projections, all tax rates are assumed to remain constant over the forecast horizon. The models will have the capability to simulate the economic and revenue impact of different tax rates, for sales and other taxes, as well as alternative economic scenarios (optimistic and pessimistic) for the nation, state, metro, and county.

The direct model results will be in seasonally adjusted quarterly frequency. We will convert them into monthly, de-seasonalized using Census X-13 procedures so as to allow comparisons of the results with the state revenue stream. After discussion with the Legislature Management team, we will develop regular reports of cash flow targets for tracking purposes.

Task 2d. Projected agriculture-related commodity prices and production values

From inputs, through producers and food manufacturers, to transport, bio-energy, chemicals and policy, IHS Markit is the only specialist agribusiness information provider covering the whole value chain with trusted proprietary data, authoritative analysis, accurate forecasts and tailored consulting, helping client make critical business and policy decisions.

IHS Markit agricultural commodity forecasts include grain, livestock, oils/oilseed/meals, dairy, sugar and sweetener, and biofuels. IHS Markit has significantly expanded our agriculture market analysis and capability through the acquisition of Informa Agribusiness Intelligence which provides coverage across the full agriculture value chain, including commodities and food, seed and crop protection, fertilizers, and policy and regulation.

The project team will integrate into the report our price and production forecasts for key agricultural commodities as well as supporting analysis of the conditions driving the forecast.

Task 2e. Projected North Dakota oil production levels

IHS Markit's Energy practice has its roots with Cambridge Energy Research Associates (CERA) which was founded in 1983 by Pulitzer Prize winning author Dr. Daniel Yergin (*The Prize*) and acquired by IHS Energy in 2004. With expertise across the global oil & gas industry, one of the hallmark research services for this project is the North America Supply Analytics Service which provides interpretation and insight into the development, critical trends, and key players for every oil & gas geological play in North America. With this insight, IHS Markit can leverage the Energy team's regularly updated forward-looking analysis of the Bakken play to understand anticipated exploration acreage as well as granular analyses of drilling activity, production forecasts and economic and operational benchmarking, to provide the North Dakota Legislative Management with oil production forecasts for the Bakken play. We will also include in the report an analysis of global crude oil markets so as to provide the Committee context of how global conditions shapes upstream activity in North Dakota.

Tasks 2f-2g. Projected population changes & Projected trends in employment

Projects in population growth is especially important as North Dakota and the US emerge from the COVID-19 pandemic. Our population experts—using our proprietary models—have recently determined that, because of the adverse developments resulting from the pandemic, population projections for 2030 are likely to be roughly 2.0% lower than previous projections. These new projections are now incorporated into the IHS Markit baseline forecast for the US economy.

The result of these changes will be a near-term downward revision in total population growth and a permanent downward revision in the level of population. Each of the underlying changes will affect segments of the population differently—the changes in birth rate projections will affect the young population; the excess mortality projections will affect the middle-aged and elderly; and the immigration assumptions will be distributed more evenly across ages.

As it relates to labor force, the working age population in the US is projected to rise to around 285 million by the end of the decade—roughly 0.7% lower than the old baseline. The labor force participation rate is projected to continue falling in the next decade, mostly because of the aging of the baby boomers. In the new baseline, the labor force rises gradually to around 168 million by 2030—roughly 2 million below the old baseline.

This information is included in the IHS Markit US Regional Model for North Dakota and will be included in the standard report to the Committee.

Task 2h. Upside and downside risks to the North Dakota economy

In addition to including our Baseline projections in the report, IHS Markit model will simulate Optimistic and Pessimistic scenario estimates for all forecasts.

Report Component 3 – Qualitative Analysis of General Economic Conditions and Demographic Trends Related to the National Economy, the Oil Industry, the Regional Economy, and the North Dakota Economy

Please see Appendix of this document for an example of the report structure intended to meet the requirements of Report Component 3.

Task 3 – Disclosure of the Limitations of the Organizations Economic Model and the Risks Related to Forecasting Error Associated with the Organization's Economic Forecasting Data

IHS Markit has produced a regular economic forecast of the North Dakota economy for three decades. We provide a track record of our forecasts of the state's employment and income projections over that time.

Any econometric model will exhibit some degree of forecast error. IHS Markit has five decades of experience curating widely accepted government and industry data measurements of the macro and micro economy. But, of course, there are measurement errors and subsequent data revisions which will result in some forecast errors. As is our standard practice, we will re-estimate models every few years to both validate the existing assumptions employed within the models as well as adjust the models, when necessary, to reflect the most current economic structure *if* and *as* the state economy evolves.

Also, our models of the economy are necessarily simplified approximations of economic activity and will miss idiosyncratic, unforeseeable events in the business world which may influence economic outcomes. IHS Markit uses best practice in constructing models and the corresponding forward-looking assumption that are used to guide them. We regularly provide alternative forecasts to reflect alternatives which might be reasonably thought to occur.

QUALIFICATIONS & EXPERIENCE OF KEY PERSONNEL

Project Staffing & Management

The IHS Markit team will work with the city to develop a communications plan that ensures an appropriate level of dialog with the city and the associated stakeholders on project tasks yet is also sensitive to our client schedules and requirements for detail. The current IHS Markit Management and Staffing plan stresses:

- ***Clarity*** of roles and responsibilities among the core project team as well as of lines of communication both between the IHS Markit team and the client - including clearly identified "primary" and "secondary" points of contacts - and among IHS Markit team members;
- ***Accountability*** of key staff over the course of the proposed Period of Performance; and
- ***Flexibility*** to respond to feedback and additional input from the client and focus research to answer specific questions covered by the scope of work over the course of the Period of Performance.

Our Management Plan includes a Consulting Executive-in-Charge and a Project Manager and will be supported by team members across the various IHS offices and disciplines.

- **Consulting Executive-in-Charge (EIC):** IHS Markit will appoint senior level staff to serve as the Executive-in-Charge (EIC). In this role, a Managing Director or higher-level staff member will be responsible for securing the necessary resources to enable successful execution of each project. The Executive-in-Charge will have the authority to augment the IHS Markit team as required to meet the government's requirements over the course of the project. The Executive-in-Charge will also be involved in reviewing the report deliverables as part of a broader, mandatory IHS Markit quality control effort. The Executive-in-Charge will assist the Project Manager in engaging colleagues across the entire IHS Markit organization that can provide the necessary technical or regional expertise to the ongoing research and analysis. Senior staff within the IHS Markit Consulting Business has extensive access to resources across IHS Markit for the purpose of identifying and engaging IHS Markit experts on topics relevant client research and analysis efforts.
- **Chief Regional Economist:** The IHS Markit Chief Regional Economist has overall responsibility for US Regional Economic Services, including the Regional Core Macroeconomic Service and the IHS Markit's Real Estate and Construction Service. The Chief Regional Economist oversees the quarterly economic forecast of the 50 states and over 300 metropolitan areas of the United States. The Chief Regional Economist regularly makes presentations of these regional economic forecasts and analysis to clients, conferences, governmental bodies and the press.
- **Project Manager:** The Project Manager provides oversight and guidance to the Lead Analyst(s) throughout the Period-of-Performance (PoP) and will serve as a quality control expert and primary point of contact. The Project Manager will serve as the point person for communications, project briefings and ensure day-to-day activities and interactions are executed smoothly and consistently.
- **Lead Analyst(s):** The Lead Analyst will be the secondary point of contact responsible for performing research and analysis in support of the project (often task specific), including working with the Project Manager to synthesize analytical outputs of the research effort.
- **Business Analyst(s):** Business Analysts will work with the Project Manager and the Lead Analyst to conduct research and analysis in support of the requirement and will contribute to the final and interim reports.

Resumes of key personnel for this effort are presented on the following pages.

JAMES DIFFLEY

Executive Director & Chief US Regional Economist
Project Title: Project Technical Lead

Relevant Work Experience: +30 Years

- Macroeconomic Forecasting
- Tax Analysis
- Economic Impact Analysis
- Revenue Impact Analysis
- Real Estate & Construction

Education:

- PhD training in Economics, State University of New York at Stony Brook
- MA, Economics, State University of New York at Stony Brook
- B.A., Mathematics & Economics, State University of New York at Buffalo

Summary of Qualifications

James Diffley is Executive Director of IHS Economics Consulting and Industry Services, with responsibility for a variety of advisory services and consulting solutions for clients in the public and private sectors. Mr. Diffley was, from 1998 to 2013, the Chief Economist of IHS Global Insight's U.S. Regional Services Group, with overall responsibility for US Regional Services, including the Regional Core Macroeconomic Service and the IHS Global Insight Real Estate and Construction Service. He regularly makes presentations of these regional economic forecasts and analysis to clients, conferences, governmental bodies, and the press. Among the customized consulting projects, Mr. Diffley has been responsible for are long-term projections of cigarette consumption, analysis of the impact of changing oil prices on local economies, and the economic impacts of the investment and operations of various industries.

Prior to joining the company, Mr. Diffley was supervising tax analyst with the New Jersey Division of Taxation's Office of Tax Analysis from 1988 to 1996, where he was responsible for developing the state economic forecast for the state executive budget and for business tax revenue forecasting. From 1982 to 1987, he was on the economics faculty at Adelphi University in New York.

Selected Project Experience

- **North Dakota Legislative Council**. Provided detailed tax revenue forecasts to the ND Legislature, leading a team which developed a model of ND tax revenues, which has been used to inform the Legislature budget efforts over the last 3 Biennium. Mr. Diffley has presented IHS Markit's economic and tax revenue forecast to the Legislature in Bismarck on several Occasions.
- **Suffolk County, New York.** Provided independent sales tax revenue estimates, updated quarterly, as part of the annual state budget setting process.
- **City of Philadelphia Department of Revenue.** IHS built an econometric model of each of the components of City tax collections based on local and national economic conditions. The model was then used to forecast City revenues for the upcoming 5-year period. Presentations and testimony have been provided since 2010.
- **U.S. Residential Real Estate Forecasts for State and Metropolitan Areas.** Responsible for all aspects of the U.S. Real Estate Service. This includes supplying a detailed analysis of demand-side drivers for the residential real estate market in each of the 50 states, the District of Columbia, and 363 metro areas and 29 metro divisions. Using input from IHS Global Insight standard models, maintained accompanying real estate models that forecast such variables as housing starts, affordability, sales prices, and mortgage originations, average monthly payments, foreclosures started, and loans past due.

- **U.S. Regional Services.** Responsibilities include management of the Regional Services Practice; economic forecast and analysis of 50 states and 319 metropolitan areas; fulfillment of consulting projects; presentations, testimony to clients; and management of client relationships.
- **New York State Revenue Forecasts.** Provided modeling, forecast, and analysis to the New York State Senate – for example, NYSTREAM model re-estimation and update; NYSTREAM forecast of revenue sources; testimony at Legislative Forecast Conference.
- **New York City MTA Revenue Forecasts.** Provided modeling, forecast, and analysis to the New York City Metropolitan Transportation Authority.
- **Rhode Island Income Tax Revenue Forecasting**. Provided a 5 fiscal year forecast of state taxable capital gains realizations with alternative scenario results. IHS built a tax model and incorporated its national and state economic forecast.
- **Pennsylvania Department of Revenue.** Continuously provided independent revenue estimates and expert testimony as part of the annual state budget setting process.
- **Projects for the U.S. Conference of Mayors.** Responsible for generating series of reports entitled The Role of Metro Areas in the U.S. Economy. In addition, as a part of the U.S. Metro Economies series, authored special reports on topical issues. Examples include U.S. Foreclosure Crisis is Having a Negative Ripple Effect on the Economies of the Nation's Metropolitan Areas, and Current and Potential Green Jobs in the U.S. Economy.
- **Cigarette Consumption Forecasts.** Provided a forecast of US cigarette consumption for the Tobacco Settlement Financing Corporation (State of New York), for use in the offering statement for the Tobacco Settlement Financing Corporation (State of New York) Asset-Backed Revenue. Also provided cigarette consumption forecasts for Louisiana, California, Rhode Island, Washington, Niagara TASC, Chautauqua TASC, and Kern County.
- **Series 2010 Financing, Virgin Islands Public Finance Authority.** Provided a report containing an overview of market for VI rum; competitive factors affecting demand, demographic data on liquor consumption; VI market position, analysis of impact of the expansion of the Cruzan production facility, and its use to provide Beam Global branded spirits to the US; and forecast of all long-term rum shipments to the US from the USVI. Results used in the prospectus for the bonds issued by Virgin Island Public Finance Authority.

Publications/Reports/Presentations/Testimonies

- US Conference of Mayors
- Builder 100 Conference
- Commercial Property News
- Council of State Governments
- Legislative Fiscal Officers Association
- National Association of Home Builders
- Numerous other consulting reports on economic impacts
- National Real Estate Investment Managers
- Bond buyer Conferences
- NY State Association of Counties
- National Association of State Budget Offices
- National Association of Industrial & Office Property Owners
- Testimony on Budget & Economic Matters to State Governments
- Frequently quoted in national media, including NY Times, San Francisco Chronicle, NBC Nightly News, CNNfn

YAN JIANG, PhD

Associate Director, IHS Economics Consulting
Project Title: Project Manager

Area of Expertise:

- Macroeconomic Modeling
- Macroeconomic Scenario Analysis
- Data Analytics and Forecast Modeling

Education:

- Ph.D. in Economics, The Graduate Center, City University of New York, 2012
- M.A. in Finance, Peking University, China, 2007
- B.A. in Economics, Peking University, China, 2004

Yan Jiang is an Associate Director in the Economic and Country Risk Consulting. Dr. Jiang joined IHS Markit in 2017. Her work during past few months has focused on economic impact analysis in energy market and state and local tax modeling capability development.

Prior to joining IHS Markit, Dr. Jiang was an econometrician at BNP Paribas Corporate & Investment Bank in New York, where she built forecasting models for key financial variables and US national and regional house prices to support the bank's non-public Comprehensive Capital Analysis and Review (CCAR) as well as Dodd-Frank Act Stress Testing (DEAST). Prior to that, Dr. Jiang worked at AIG as an economist, where she developed proprietary UK regional house price forecasting models and supported the group's US commercial real estate forecasting for several budget rounds and internal stress tests.

Dr. Jiang has been involved in conducting economic research, developing forecasting models and conveying findings to diverse audience in the finance industry. She has worked with Macroeconomic Advisors, Oxford Global Economic, and Moody's Models. She worked closely with both AIG and BNP's model review groups to fulfil regulatory requirement for model validation. In addition, she has provided scenario forecasts to four rounds of internal stress tests at AIG and two rounds of non-public CCAR stress tests at BNP.

CURTIS SMITH

Executive Director, IHS Energy Consulting
Project Title: Lead Analyst – Oil & Gas

Area of Expertise:

- Oil & Gas Supply & Forecasting
- Upstream Oil & Gas Industry
- Project Management

Education:

- MS, Geology, Brigham Young University
- BS, Geology, Brigham Young University

Summary of Qualifications

Mr. Smith is a Director in the Consulting Division of IHS Energy, with over 20 years of experience, and is responsible for oil and gas supply and forecasting, as well as other strategic projects including North American and International basin studies and play analysis, market studies, mapping and technical analysis, and workflow-based client training. Mr. Smith has been at IHS Energy for over 15 years and previously worked at Marathon Oil Company and ConocoPhillips Company, Oil Majors.

While his experience covers a wide range of technical and business-related projects as well as training and support, his key strength is a knowledge of technical and business data and products (with a strong focus on IHS data, tools and products) and their use and application in the upstream oil and gas industry, particularly in the realm of Unconventional Resources. With respect to unconventional resources, he has worked well performance, development cost, the use of technology and future potential for the majority of important North America unconventional plays.

Recent experience includes managing and delivering consulting projects, utilizing information from IHS US and Canadian well and production databases with a heavy emphasis on unconventional plays.

RYLAND MALTSBARGER

Associate Director, IHS US Regional Economic Services
Project Title: Lead Agriculture Analyst

Area of Expertise:

- Agricultural Commodity Price Watch
- Agriculture Price & Purchasing
- Global Cotton, Crop Costs, Sugar

Education:

- MBA, Information Systems, University of Missouri
- BS, Agricultural Economics, University of Missouri

Summary of Qualifications

Ryland Maltsbarger is the Associate Director of IHS Agriculture. He manages the team of agriculture economists for the global agriculture supply, demand & price forecast out to 2030. The core focus remains on understanding strategic long-term impacts of feed, food and industrial demand in concert with supply constraints of global area and production potential. His individual focus is global sugar, global cotton and crop cost of production.

Selected experience includes:

- ***Global Forecasting & Scenarios***: organized a global modeling team to produce a global forecast for crops and livestock; reviewed global forecast and scenario output for accuracy and consistency; presented forecast and scenario results to agricultural input and food supply chain clients; scenario work included high/low global population scenarios, China GDP hard landing agriculture impacts scenario, Indian meat preference shirt scenarios.
- ***Multi-Client Studies***: Launched the impacts of weather and climate change on global agriculture markets for the IHS long-term variability study. The study quantified magnitude of yield-based impacts on production of agriculture commodities implementing a Monte Carlo scenario of occurrences to affect global supply and demand for major agriculture producers.
- ***Global Model Expansion***: Expanded and refined international partial equilibrium models for cotton and sugar to 2050. Redefined long-term production and consumption patterns based on trade patterns, culture variables, and political policies. Expanded global cotton model to include 8 extra countries to increase understanding of expanding markets. Implemented non-linear engle curve dynamics on food consumption patterns.
- ***Global Sugar Modeling***: Developed a non-spatial econometric model of the international sugar industry including 74 countries/regions for sugarcane, sugar beets and centrifugal sugar. The model contains 58 trade/policy variables, 76 macroeconomic variables and 14 associated prices. The model simulated intra-country production decisions as well as global trade analysis. Sugarcane ethanol production currently included for three countries, including dynamic Brazilian sugarcane milling substitution of ethanol versus sugar.

TOM JACKSON

Manager, US Regional Service
Project Title: Analyst

Area of Expertise:

- Economics & Econometrics
- Agricultural and Applied Economics

Education

- MS, Agricultural Economics, the Ohio State University
- BS, Agricultural Economics, the Ohio State University

Summary of Qualification

Tom Jackson is Manager and Principal Economist in the US Regional Economic Service of IHS Markit, with responsibility for economic forecasts of states in the eastern portion of the Midwest/Great Lakes region. Mr. Jackson has been with the US Regional Service for nine years – prior to that, he served from 1999 to 2011 in the Agriculture Service with the company. In each role, he has played a leading role in forecast development and evaluation, and in communicating with clients. Mr. Jackson also has represented IHS Markit through many news media outlets, including CNN, MSNBC, The Wall Street Journal, and USA Today, to name a few.

As part of his regional focus, Mr. Jackson has developed specific expertise in major industries such as unconventional natural gas, downstream oil and gas processing, and automobile manufacturers and suppliers. He has provided support for many major consulting projects within the company, including regional impacts of the development of unconventional natural gas and oil, impact of relaxing US barriers to oil exports, and the impact of renewable fuels standards on the US agriculture sector.

Selected Relevant Experience

U.S. Regional Economic Services. Responsibilities include management of four colleagues; economic forecast and analysis of 6 states and their metropolitan areas; fulfillment of consulting projects; presentations, testimony to clients; and management of client relationships.

Economic Impact Studies of a wide range of national and regional economic events including deployment of new technology, policy changes, and drought.

Tax Revenue forecast models at the city and state level.

KARL KUYKENDALL

Principal Economist, IHS US Regional Economic Services
Project Title: Analyst

Area of Expertise:

- Regional Economic Forecasting
- Economic Impact Analysis

Education:

- BA, Economics, Commonwealth Scholar, University of Massachusetts, Dartmouth

Summary of Qualifications

Karl Kuykendall is a Principal Economist in the IHS Markit Economics US Regional Group. He prepares forecasts and written analysis for several states in the South region, including Alabama, Florida, Louisiana, Oklahoma, North Dakota, Texas, and the metropolitan statistical areas (MSAs) of those states. Mr. Kuykendall tracks regional economic developments daily closely monitoring regional outlooks and emerging trends. He regularly makes presentations of these regional economic forecasts and analysis to clients, conferences, and the press. Mr. Kuykendall is involved in the Regional group's economic impact assessment modeling and works on consulting projects, including reports on transportation and international trade, analysis of the Community Development Block Grant program's impact on metro area economies, analysis of the economic impact of tax-exempt bonds, and capital spending impact studies for several utilities.

EMILY HANSON

Senior Consultant, IHS Markit Economics Consulting
Project Title: Senior Economist

Area of Expertise: 10+ Years

- Regional economics
- Financial economics
- Labor economics

Education

- MA, Economics, Clemson University
- BA, Applied Statistics, American University

Summary of Qualification

Emily Hanson is a Senior Consulting Analyst within the Economic and Country Risk group at IHS Markit. Her work focuses mostly on stress testing for banking clients. Some of her tasks include collecting and cleaning financial data, developing and producing documentation for custom financial models, and running BHC and the FRB's CCAR scenarios for stress testing clients. Other consulting projects include using regional economic forecasts to produce tax revenue projections for the state of North Dakota, providing multifactor productivity outlook for U.S. Centers for Medicare and Medicaid Services, modeling plastic demand by region using megatrend drivers such as urbanization and the rise of the middle class for the American Chemical Council, and researching roadway conditions in Texas for an infrastructure report for Texas Oil and Gas Association.

Selected Relevant Experience

- North Dakota Legislative Council: *Economic Forecasting & Industry Report: The State of North Dakota*– Project Role: key; Date of Final Report: Sept. 2020
- American Chemical Council: *Population Growth and Materials Demand Study*– Project Role: key; Date of Final Report: Aug. 2019
- Texas Oil and Gas Association: *Critical Infrastructure for Texas Growth*– Project Role: key; Date of Final Report: March 2019

Through her project work at IHS Markit, Emily has demonstrated proficiency in EViews. She also has experience with R and Python.

BRENDAN O'NEIL

Executive Director, IHS Economics Consulting
Project Title: Executive-in-Charge

Relevant Work Experience: 20+ Years

- Project Management
- Economic Development
- Agriculture
- Construction
- Energy
- Public & Private Sector Business Development

Education:

- Graduate studies at Suffolk University
- BA, Political Science, Syracuse University

Mr. O'Neil will be responsible for contract negotiation and administration and will serve as Executive-in-Charge of this engagement. These responsibilities include the allocation adequate project resources, coordination of any public media releases associated with project, and ensuring overall "Customer Delight," IHS Markit's standard for delivering client value, satisfaction and overall effectiveness of the project results.

Mr. O'Neil is the Commercial Lead for Economics Consulting in the IHS Markit Economics & Country Risk Group. Among Mr. O'Neil's responsibilities are client solution architecture and oversight of the Federal, State & Local Government and Trade Associations segments of the Economics & Country Risk business. In addition to his sector development efforts, he is responsible developing client and strategic partner relationships and executive management of client engagements. Mr. O'Neil has specialized in assisting clients with their market planning and forecasting, economic and policy impact analysis, and supply chain cost containment efforts. With over 20 years of experience in market and policy research, Mr. O'Neil has expanded the firm's reach by engaging clients in a wide range of industry sectors and through multiple product and capability launches.

Prior to joining IHS Markit, Mr. O'Neil served in various client-facing roles at Global Insight, World Markets Research Centre and Forrester Research. Mr. O'Neil's policy experience stems from his work in Massachusetts and New York state legislatures.

PROPOSED PRICING

IHS Markit proposes to undertake this task for a firm fixed price of $79,825 for the three economic forecasting reports due on September 30, 2022, January 13, 2023, and March 24, 2023, respectively. Should NDLM and the Government Finance Committee seek to extend the contract for reports updates scheduled for September 27, 2024, January 17, 2025 and March 21, 2025, the renewal fees will remain the same as the base contract year fees ($79,825).

BILLING AND REVENUE ACCRUAL

As a publicly traded company, IHS Markit is subject to Sarbanes Oxley requirements and must disclose our planned revenue accrual schedule associated with this engagement. This is solely an internal accounting requirement and has no effect on the deliverables, billing, or total price. For this project, IHS Markit proposes revenue accrual and billing schedule to be the same and in accordance with the table presented below.

Deliverable	Estimated Timing of Deliverable	Percentage of Final Pricing
Kickoff meeting	February 2022	10%
Submission of Report in September 2022	September 2022	30%
Submission of Report in January 2023	January 2023	30%
Submission of Report in March 2023	March 2023	30%

CLIENT REFERENCES

IHS Markit provides data and analysis to all fifty U.S. states. The majority of those states are utilizing our forecasting services to perform fiscal budget preparation, revenue forecasting, and our economic outlook is frequently used as the basis for short-term fiscal (e.g., annual or biennial budgeting) and long-term capital investment planning (e.g., infrastructure, bond issues). These services are utilized by state legislatures and state Departments of Finance/Revenue/Taxation. A sample of clients and references for our custom revenue forecast services is listed below.

North Dakota Legislative Council, State of North Dakota
Address: State Capitol, 600 East Boulevard Avenue, Bismack, ND 58505
Contact: Allen Knudson, Adam Mathiak
Phone: 701-328-4231
Email: aknudson@nd.gov
Performance Period: 2017-2021
Description of Service Provided: The North Dakota Legislative Assembly sought external support in estimating the state's tax revenue and economic forecast to update the 2017-19 biennium revenue forecast and develop the 2019-21 biennium revenue forecast. Due to the volatile nature of several industries key to the North Dakota economy, scenario capabilities were necessary. Additionally, the North Dakota Legislative Assembly required the qualitative assessment of both national and local economic conditions and demographic trends that are driving these projections.

IHS Markit developed an econometric model that blended proprietary macroeconomic, pricing, and industry forecasts with revenue trends to incorporate both short- and long-term national and state-level economic forecasts. IHS Markit equipped the model to generate three scenarios to project baseline, optimistic, and pessimistic outlooks for the North Dakota economy and industry-level short-term outlooks for sectors of special importance to the state's economy, oil & gas and agriculture. The project team provided additional "deep dives" into four tax streams: sales and use tax, motor vehicle excise tax, individual income tax, and corporate income tax, which highlighted relevant economic indicators and their variability over time. Tax projections were evaluated in the year following the estimate and IHS Markit was rehired for additional work for the following biennium revenue forecast.

City of Philadelphia Office of Budget and Program Evaluation
Address: City of Philadelphia, MSB 1401 JFK Blvd, Philadelphia, PA 19102
Contact: Marisa Waxman, Budget Director
Phone: (215) 686-6558
Email: Marisa.Waxman@phila.gov
Performance Period: ongoing
Description of Service Provided: The City of Philadelphia Office of Budget and Program Evaluation (OBPE) has retained IHS for several years to support the City's planning, budgeting, revenue estimating and economic forecasting efforts. The IHS analysis supports the Director of Finance in preparation of the City's annual operating budget, Five Year Plan, capital program and capital budget. OBPE requires that a consultant either have or develop the economic modeling framework that can address how income, housing activity and corporate profits impact the City's revenue streams, such as the Wage Tax, Business Income and Receipts Tax, Net Profits Tax, Real Estate Tax, Real Estate Transfer Tax, Sales Tax, Parking Tax and Amusement Tax. The end-product delivered by IHS is current fiscal year and 5-year forecasts of the aforementioned taxes,

participation in meetings and presentations that require a detailed explanation of the consultant's modeling framework, retrospective analysis of forecasted versus actual revenue, a monthly outlook of the Philadelphia economy and qualitative assessment of trends and drivers.

County of Suffolk, State of New York
Address: Office of the County Executive, 100 Veterans Memorial Highway, Hauppauge, NY 11788
Contact: Stephanie Rubino, Assistant Budget Director
Phone: 631-853-5913
Email: stephanie.rubino@suffolkcountyny.gov
Performance Period: 2017-present
Service Provided: IHS was retained to 1) develop a model of Suffolk sales tax revenues; 2) apply our macroeconomic and regional economic forecasts to the current, and upcoming five year budget planning; 3) provide a separate accounting of their energy (mainly retail gasoline) sales, the most volatile part of their revenue in recent years; 4) provide a written report supporting the forecast for inclusion in the County Executive's budget proposal; 5) provide forecast updates with a report detailing any changes in the economic or revenue outlook. Using the results from IHS reports, Suffolk has substantially improved their budget planning accuracy after years of revenue shortfalls.

Commonwealth of Pennsylvania – Department of Revenue
Address: 1147 Strawberry Square, Harrisburg, PA 17128
Contact: C. Dan Hassell, Revenue Secretary
Phone: (717) 787-4099
Performance Period: ongoing (for over 20 years)
Description of Service Provided: IHS Global Inc. has been continuously engaged with this client to provide independent economic estimates and expert testimony as part of the annual state budget setting process.

Rhode Island Department of Revenue – Income Tax Revenue Forecasting
Address: One Capitol Hill, Providence, RI 02908
Contact: Paul Dion, PhD, Chief of Revenue Analysis
Phone: 401-574-8943
Performance Period: 2016-present
Service Provided: Client desired a 5 fiscal year forecast of state taxable capital gains realizations with alternative scenario results. IHS built a tax model and incorporated its national and state economic forecast.

Arkansas Bureau of Legislative Research
Address: State Capitol, Room 115, Little Rock, AR 72201
Contact: Mr. Richard Wilson (retired)
Telephone: 501-682-1937
Email: richardw@blr.arkansas.gov
Performance Period: 2013
Services provided: The State of Arkansas was considering issuing general obligation bonds to support a major economic development project - the Big River Steel (BRS) plant, a $1.1 billion electric arc furnace (EAF) steel mill. The State was considering providing a package of direct economic incentives (e.g., low interest loans, construction grants), and indirect incentives (e.g.,

tax deductions and credits), with a potential cost of almost $300 million over a 20-year period. IHS was retained by the State to assess: 1) the long-term economic viability of the proposed BRS plant; and 2) benefits and costs to the state in terms of the costs of the incentives provided and the NPV of the tax revenues received by the State. IHS concluded that the steel industry can absorb the addition of Big River Steel plant, but if any other major plants other those already announced, were built, then BRS plant's production goals and operating margins would not be achieved, reducing the level of production and also the tax revenues needed to cover the costs of the economic incentives. The benefit-cost analysis found that in the most optimistic scenarios that the net economic benefits were barely positive, and in most cases the NPV of the costs exceeded benefits if the plant's capacity factor and sales were too low. Two representatives from IHS presented testimony to, and answered questions from, a joint session of the Arkansas Legislature.

Arkansas Bureau of Legislative Research
Address: State Capitol, Room 115, Little Rock, AR 72201
Contact: Mr. Richard Wilson (retired)
Telephone: 501-682-1937
Email: richardw@blr.arkansas.gov
Performance Period: 2015
Services provided: IHS was retained again by the State of Arkansas Bureau of Legislative Research to evaluate an economic incentive package be offered to attract the manufacturing facility for the joint light tactical vehicle (JLTV) production facility (i.e., the next generation of Humvees). IHS presented testimony to the Arkansas Legislature. Lockheed Martin (LM) proposed to locate a facility to assemble joint light tactical vehicles (JLTVs) adjacent to one of their existing plants in the Highland Industrial Park in Calhoun County in southcentral Arkansas. LM was one of 3 companies competing for a contract from the US Department of Defense (DOD) to produce approximately 54,600 JLTVs between 2016 and 2040. The State of Arkansas proposed an economic incentive package under Amendment 82 to the Arkansas Constitution which permits it to issue general obligation bonds to finance infrastructure improvements or other needs to attract large industrial projects. Arkansas would provide $84.645 million in infrastructure improvement and job training, paid for by proceeds from a bond issue. IHS was retained by the Arkansas Bureau of Legislative Research to analyze the proposed economic incentive package. We were specifically asked to determine if the net present value (npv) of the additional major state-level tax revenues (e.g., personal income, corporate income, and sales and use) generated by the increased economic activity attributable to the construction and operation of the JLTV facility would exceed the npv of the costs incurred by Arkansas (i.e., the net present value of the bond debt service). IHS conducted the analysis over a 25-year period from 2016 through the final year of scheduled production in 2040. We concluded that there would be positive return to the State over the 25-year analysis period, with the bulk of the benefits occurring after the bond debt service payments ended.

Minnesota Department of Employment and Economic Development
Address: 332 Minnesota Street, suite E-200, St. Paul, MN 55101
Contact: Neal Young
Phone: 651-259-7196
Performance Period: 2015
Email: neal.young@state.mn.us
Service Provided: At the request of the Minnesota state legislature, IHS conducted a study for the Minnesota Department of Employment and Economic Development estimating the impacts of

crude oil production in North Dakota's (ND) Bakken shale formation on the Minnesota (MN) economy. The study was released to the public in late April 2015. Three direct spending effects were considered: 1) sales of goods and services by MN companies to support oil production in ND; 2) transportation infrastructure investments and 3) changes in agricultural income. The study had four tasks: 1) forecast crude oil production and spending in North Dakota under three oil price scenarios; assess the impacts of transporting crude oil and required inputs such as frac sand on transportation systems; 3) estimate total economic impacts from the three direct effects, including changes in state level tax revenues; and 4) describe prospects and expectations for maximizing the economic development benefits. IHS developed estimates of the types of goods and services used in oil production and in the construction of the proposed $3.3 billion Sandpiper crude oil pipeline, half of which would be located in Minnesota. The economic impact analysis considered the direct, indirect and induced economic impacts generated using the IMPLAN model. Our primary finding is that the total economic impacts in Minnesota from ND oil production are modest, generally producing increases of less than 1% in the level of state-wide economic activity.

Connecticut Innovations (State of Connecticut Investment Fund)
Address: 865 Brook Street, Rocky Hill, CT 06067
*Contact***:** Ms. Karin Lawrence, Senior Vice President, Public and Specialty Finance
Phone: 860 258-7814
Performance Period: 2013 through 2016
Service Provided: IHS analyzed two proposed tax increment financing districts (TIFs) established to pay for site improvements requested by developers of major retail projects. A portion of the incremental sales tax revenues generated by each project would be used to pay debt service on general obligations issued by CT to pay for the improvements. IHS determined the probability that each project would generate enough tax revenues to pay for the requested improvements. Required state and local forecasts of sales tax revenues.

State of New York – Senate Finance Committee
Address: Office of Fiscal Studies, Legislative Office Building, Albany, NY 12247
Performance Period: approximately 20 years
Service Provided: IHS has been continuously engaged with this client to provide independent revenue estimates for all state tax revenue streams and expert testimony as part of the annual state budget setting process.

APPENDIX – IHS Markit Sample Economic & Fiscal Report

Please refer to the following pages for a sample Economic & Fiscal Report for the State of North Dakota.

Economic Forecasting & Industry Report

THE STATE OF NORTH DAKOTA

March 19, 2021

Table of Contents

I. Project Overview

North Dakota Legislative Assembly goals:

- The North Dakota Legislative Assembly sought the support of a professional services firm with the capabilities to support the state's revenue estimating and economic forecasting efforts.
- The Legislative Assembly required that a consultant either have or develop the economic modeling framework that can address how the economy impacts its revenue streams.
- The end-product required of the Legislative Assembly's consultant will be used for updating the 2019-21 biennium revenue forecast and developing the 2021-23 biennium revenue forecast.
- The information must be provided in context of both short- and long-term economic behavior (out to 2021 and 2025, respectively) with forecast expectations of the national economy as well as detailed economic forecasts specific to North Dakota's economy.
- All forecasted values will be provided in terms of a baseline, optimistic, and pessimistic scenarios with probability assignments to each outcome. And finally, in addition to their quantitative requests, the North Dakota Legislative Assembly requires the qualitative assessment of both national and local economic conditions and demographic trends that are driving these projections.

About IHS Markit

- IHS Markit is a leading source of information, insight and advisory services in the pivotal areas that shape today's business and policy landscape: economics, financial markets, energy, chemicals, technology, logistics and transportation, healthcare, geopolitical risk, sustainability and supply chain management.
- IHS was founded in 1959 and became a publicly traded company on the New York Stock Exchange in 2005.
- In July 2016, IHS Inc. and Markit Ltd. merged to form IHS Markit Ltd. (NASDAQ: INFO), a world leader in critical information, analytics and solutions for the major industries and markets that drive economies worldwide.
- IHS Markit has more than 50,000 key business and government customers, including 80% of the Fortune Global 500 and the world's leading financial institutions.
- By providing in-depth analysis and forecasts down to the local level, IHS Economics team of over 300 of economists and analysts serve as valuable extensions to our client organizations' staff and provide the data and analysis they need to make high impact business and policy decisions.
- As much as possible, IHS Markit has utilized our existing US Macroeconomic and Regional modeling infrastructure to meet the Legislative Management's economic forecasting requirements. This allowed IHS Markit to immediately begin the more detailed work on behalf of the State tax revenue models and minimized the development cost associated with building new models.

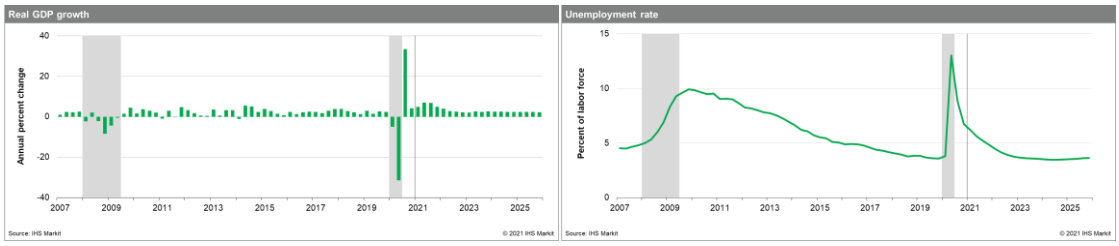
II. Major Economic and Demographic Drivers in the North Dakota Economy

US Macroeconomy

OVERVIEW

Little change in GDP growth forecast, but with notable revisions in details

- BEA's second estimate showed real GDP grew 4.1% in Q4, revised up 0.1 percentage point from the first estimate. Neither that revised growth nor its composition differed enough from our expectations to alter the forecast. While government purchases declined 1.1% in Q4, real final sales to private domestic purchasers—the best barometer of domestic demand—grew an unrevised, firm 5.6%.
- Our forecasts of real GDP growth for 2021 and 2022 are 5.7% and 4.1%, unchanged from last month, and above the 12 February Blue Chip consensus forecasts of 4.9% and 3.8%. Beneath the unchanged headlines were notable revisions in details.
- Last month's forecast included an assumed $1.5 trillion in new federal pandemic relief. With versions of the American Rescue Plan (ARP) Act costing close to $1.9 trillion having passed in the House and Senate, we've included nearly that full amount in this month's forecast. Why, then, haven't we revised up the growth forecast? There are several reasons.
- First, new cost estimates from CBO suggest that spend-outs of grants to states for education and infrastructure, as well as funds for COVID-19 mitigation, will be slower than we assumed.
- Second, after monitoring debate in the Senate last week, we lowered our assumed enhanced federal unemployment benefit from $400/week to $300/week, with a measurable impact on PCE in 2021.
- Third, recent firming in Treasury yields encouraged us to revise up our near-term projections of the 10-year note yield, by 20 basis points in 2021 and by 10 basis points in 2022. This undermines interest sensitive components of aggregate demand.
- Fourth, firming interest rates stabilized the dollar, which we now project to appreciate modestly rather than depreciate further. This lowered net exports despite an upward revision in projected domestic oil production that raised net petroleum exports.
- We've revised up the price of Brent crude oil, but only for 2021. In conjunction with the upward revision in the dollar that undermines import prices, this led to a downward revision in 2022 of core PCE inflation, from 1.9% to 1.7%.
- The three conditions for "lift-off" (maximum employment, core inflation at 2%, and expected to exceed 2% moderately) are met in mid-2024; hence we've not changed our Fed call. The forecast shows the 10-year T-note yield, currently near 1.5%, reaching 2% by late 2023, and 3% by 2028.



CAA and ARP lift GDP by 2% this year; pace of return to "normal" consumption frames the recovery

- Three elements of the recent Consolidated Appropriations Act (CAA) and the pending ARP Act have significant impacts on our forecast of near-term growth: checks and emergency unemployment benefits, which support PCE by boosting disposable income; subsidies to businesses that support corporate profits (and hence dividend income) and proprietors' income; and, government purchases of goods and services that are recorded as GDP. Most of those purchases are for COVID-19 mitigation: testing, procurement and distribution of vaccines, and purchases of equipment.
- We estimate the propensity to consume stimulus checks is low (0.15) and spread over several quarters. The propensity to spend unemployment benefits, which we view as replacing labor income for incomeconstrained households, is 1, but also spread over several quarters. The propensities to spend incomes supported by subsidies are intermediate. Based on these parameters, our models suggest the two bills will boost the level of GDP by nearly 2% this year and next, but by waning amounts in subsequent years.
- A second critical element in the forecast is the pace at which consumption returns to a normal (or "target") relationship with income and wealth. That pace is determined not just by how quickly the pandemic is brought under control and restrictions lifted, but also by the persistence of any precautionary increase in saving even after the virus is controlled.
- In the forecast, consumption rises towards target at a pace modestly faster than suggested by the "slow" response of consumption to "shocks" estimated over history.This reflects our judgement that the current recovery is particular to the easing of the pandemic.
- However, we also assume that a shortfall of consumption persists for several years; that is, a precautionary increase in saving. The base forecast shows
- GDP growth this year and next of 5.7% and 4.1%. With the slow return to normal, those growth rates drop to 5.3% and 3.0%, respectively. With the fast return to normal, they rise to 6.6% and 5.7%. The differences are wider in 2022 than 2021 because much of the impact of the alternative assumptions falls too late in 2021 to have its biggest impact this year. With some epidemiological projections now showing most of the US population vaccinated by the end of this year, these results suggest some upside risk to our base forecast.

Dollar appreciation, easing of oil prices from current highs limit core inflation below 2% through mid-2023

- The all-urban consumer price index (CPI) rose 0.4% in February following a 0.3% increase in January. The price index for gasoline rose 6.4%, contributing to a 3.9% increase in the CPI for energy and accounting for over half of the rise in the overall CPI. The food index rose 0.2% while the core CPI, which excludes food and energy prices, rose 0.1%.
- Outside of the energy, inflation remained subdued through February. The 12-month change in the CPI was 1.7%, while for the core CPI, it was 1.3%, little changed from a low point of 1.2% in May and June of 2020.
- Over the last five months, the core CPI has risen at an average annualized rate of just 1.0%. Core inflation continues to be restrained by slowing increases in rents and declines in prices for apparel and medical care commodities.
- Since the start of the pandemic, core inflation as measured in the CPI has declined by much more than core inflation within personal consumption expenditures (PCE). In 12-month changes, core CPI inflation fell 1.5 percentage points from February 2020 to February 2021. We estimate that core PCE inflation on the same basis fell just 0.3 percentage point over the same span, to 1.6%. One major cause of this is a larger impact on the CPI from the slowdown in rent inflation.
- Labor market slack, reinforced by disinflationary effects of a modest dollar appreciation and an easing of oil prices from recent highs, will maintain core PCE inflation below 2% until 2023 when tightening labor markets will push inflation to 2%.
- Under its new operating strategy, the Fed will encourage inflation moderately above 2% to reinforce that its 2% objective is an average, not a ceiling. Accordingly, the forecast shows core PCE inflation averaging 2.2% from 2024 through 2030.
- Commodity prices are rebounding, driven higher by increasing demand and, in some industries, supply chain disruptions. So far, however, the result has been only to reverse the sharp widening of margins that occurred in the second quarter of last year.

Fiscal stimulus, low borrowing costs, and robust business confidence to boost investment spending

- Fiscal stimulus is boosting the economy broadly and supporting investment spending generally. The passage of the American Rescue Plan will provide a lift to the overall economy that will feed back into the investment sector, encouraging businesses to invest in plants and equipment.
- Orders and shipments of nondefense capital goods excluding aircraft have surged above their pre-pandemic trends, setting the stage for near-term strength in equipment spending.
- Resumed deliveries of Boeing’s 737 MAX line of aircraft is propping up fixed investment in the near term.
- The pace of light vehicle sales slowed in February (to 15.7 million, annual rate). This is somewhat below the average since last fall. Consumer leases,

which are counted as investment spending in the National Accounts, have been robust in recent months. What has prevented a full recovery to pre-pandemic norms has been lagging fleet sales, a segment of the market that likely will not recover until the travel sector recovers.

- The recovery in oil prices has led to rising drilling activity, which will give way to solid growth of investment in mining structures over the next few years.
- Business fixed investment is expected to grow at annual rates averaging 6.3% in the first two quarters of 2021. After this year, business fixed investment slows to growth of 6.0% next year and 4.5% over the following two years.
- Business confidence about future output will help to fuel growth of investment spending, as will historically low borrowing costs, easing bank lending standards, and improving attitudes about risk.

The US goods deficit is back on its pre-pandemic path

- The US goods deficit is back on its pre-pandemic path, one of widening total and non-petroleum deficits, and small petroleum surpluses (nominal dollars). In the early months of the pandemic, the total and nonpetroleum deficits contracted after imports collapsed more than exports. In January, the goods deficit widened by $1.3 billion to $85.4 billion, the second largest reading ever.
- China has regained its position as the US's second leading trading partner, after the Eurozone.
- Nominal goods imports—driven mostly by consumer goods and then capital goods—climbed to a record high in January. The remarkable gains in imports are partly explained by the pandemic: computers, medical equipment, and pharmaceuticals are soaring; motorcycles, toys, and stereo equipment—used to cope with the pandemic—have also surged.
- Nominal goods exports have regained nearly all ground lost to the pandemic—goods exports in January were 0.7% below their year-ago value. Capital goods increased 3.9% January, but remain 6.8% below the 2020 January reading. Consumer exports, which dropped 3.8% in January, falling 2.5% behind its year-earlier value, are also struggling. Food exports have shot up recently and stand 25.2% above the year-ago reading.
- We look for real exports and imports to continue growing over the coming quarters as the US and its trading partners ramp up production.
- Net exports deduct 1.2 percentage points from growth this year on surging imports; in 2022, imports deduct and exports add offsetting amounts to GDP growth.
- The firming of yields has halted the recent depreciation of the US dollar, which we now project to appreciate modestly rather than depreciate further before then recovering.

Declining infections and loosening restrictions raise prospects for robust employment gains

- Nonfarm payroll employment rose 379 thousand in February, surpassing expectations. Private payrolls expanded by more (465 thousand). The

unemployment rate declined 0.1 percentage point to 6.2%. After two largely dismal employment reports in December and January, the February employment report was a welcome moderate surprise to the upside.

- Payrolls remain 9.5 million below the pre-pandemic peak reached February of last year. About three-quarters of this shortfall is in private service-sector employment. It will take further robust gains in aggregate demand and continued relaxation of restrictions on social and economic activity to pull employment back in line with the pre-pandemic trend.
- Unusually harsh winter weather across much of the US had an impact on a few aspects of February's employment report. Employment in the construction sector fell by 61 thousand in February, the first decline in construction employment so far in the recovery. Also, the private workweek declined sharply in February, led by an outsized decline in the construction industry.
- In the Household Survey, the unemployment rate declined 0.1 percentage point to 6.2%. This reflected a solid gain in civilian employment (208 thousand) that outpaced a 50 thousand increase in the civilian labor force.
- Recent news provides ample reasons for cautious optimism: initial claims have generally declined since mid-January and as of 6 March stood at a 4-month low of 712 thousand, new daily COVID-19 infections have declined substantially since the beginning of the year, the vaccination campaign is accelerating, and another large round of fiscal stimulus was recently enacted. Combined, these factors provide hope for a robust and sustained recovery in labor markets over the remainder of the year.
- We project that after gaining 7.2 and 1.8 million jobs in the third and the fourth quarters of 2020 respectively (on a quarterly average basis), payrolls will increase 0.4 million in the first quarter of 2021 before increasing by 2.0 million in the second quarter. The unemployment rate is expected to continue declining, reaching an average of 4.9% by the end of the year.

Stimulus gives incomes another boost

- According to BEA's second estimate, real disposable personal income (DPI) fell at a 10.0% annual rate in the fourth quarter of 2020 after a decline at a 17.4% rate in the third. These declines followed a 48.6% surge in the second quarter due to the CARES Act and left real disposable income still 3.2% above its level as of the fourth quarter of 2019.
- Nominal wage and salary compensation of employees continues to gradually rise. After plunging a cumulative 10.3% (not annualized) from February through April, wage and salary disbursements posted nine monthly gains that left their twelve-month change at 1.1% in January. However, due to data revisions stemming from the Quarterly Census of Employment and Wages, this was a smaller positive twelve-month change than had previously been recorded for December.
- In the version of the American Rescue Plan Act that was ultimately enacted, the enhanced unemployment benefit was reduced from $400/week to $300/week, but the first $10,400 of benefits were exempted from 2020 income taxes.

- Real DPI grew 5.8% in 2020. In large part due to the two major fiscal stimulus bills that have been passed since November, we estimate that real DPI will grow at annual rates of 23.7% and 26.9% in the first and second quarters of 2021. The second quarter's growth represents an 8.5-percentage point upward revision from last month's forecast. This results in a total (front-loaded) increase of 2.9% (year-over-year) in 2021, 0.4 percentage point higher than last month. Real DPI is then forecast to give back 1.9% in 2022.
- The personal saving rate, which reached a historic 26.0% in the second quarter of 2020 before falling back to 13.4% in the fourth, is forecast to jump to 20.3% in the second quarter of 2021.
-

Between two stimulus bills, nearly $3 trillion of pandemic relief has been enacted within three months

- On 11 March, President Biden enacted the $1.9 trillion American Rescue Plan (ARP) Act. Including the recent Consolidated Appropriations Act (CAA), Congress has now approved nearly $3 trillion of pandemic relief within three months.
- ARP, which was modified only slightly in the Senate, includes $1,400 stimulus checks, extension into September of emergency unemployment programs and benefits, temporary expansions of refundable tax credits, funding for COVID-19 mitigation, and financial support for state and local governments, the transportation sector, agriculture and nutrition programs, and renters.
- The forecast reflects the full ARP, approximately $400 billion more than we assumed last month. However, given slower spendouts, higher term yields, and a stronger dollar than previously assumed, we maintained our forecast of GDP growth this year at 5.7%. We estimate the combined effect of CCA and ARP will boost the level of GDP this year and next by approximately 2%.
- Aid to state and local governments, both general and specifically purposed, is several times larger than in the CARES Act. Along with rapidly recovering tax revenues, this will prevent the usual post-recession state and local fiscal contraction.

The global economy awaits liberation from COVID-19 pandemic

- In our latest forecast, real trade-weighted GDP for advanced foreign economies is forecast to grow 4.0% in 2021 after having contracted 5.8% in 2020. For emerging market economies, real GDP is forecast to grow 5.3% in 2021 after having fallen 4.4% in 2020.
- We project that the value of the real trade-weighted broad dollar reached a cyclical high in the second quarter of 2020; we forecast that the real dollar appreciates in mid-2021 before again slipping gently from 2022-2024.
- The JPMorgan Global Composite Output Index (compiled by IHS Markit) rose 0.9 percentage point to 53.2 in February, indicating rising output for the eighth straight month.
- The COVID-19 pandemic continues to shape global and regional economic activity in 2021. A tightening of virus containment measures in late 2020 and early 2021 has stalled global real GDP growth in the first quarter.

- Turning the corner: Since cresting in January, new COVID-19 virus infections have declined globally. Countries hit hardest by a winter wave of infections—including the United Kingdom, Spain, the United States, and Russia—are seeing remarkable improvements.

Bottom line for the US economy

- Real GDP is forecast to grow 5.7% in 2021 and 4.1% in 2022, unchanged from last month.
- The forecast incorporates the Senate version of the $1.9 trillion American Rescue Plan (ARP).
- The recent Consolidated Appropriations Act (CAA) and the ARP Act boost the level of forecasted GDP by nearly 2% this year and next, but by waning amounts in subsequent years.
- Real GDP surpasses its previous peak in the second quarter of 2021; the output gap is eliminated by mid-2022.
- Core PCE inflation reaches 2% in late 2023.
- We have not changed our Fed call. The conditions for Fed "lift-off" are still met by mid-2024.

Real GDP and its components

Percent change, annual rate	20Q3	20Q4	21Q1	21Q2	21Q3
Real GDP	33.4	4.1	4.9	7.0	6.8
Consumption	41.0	2.4	4.7	6.6	7.0
Residential investment	63.6	36.9	19.0	5.8	-3.9
Business fixed investment	22.9	14.0	7.5	5.0	8.7
Federal government	-6.2	-0.9	21.7	-9.5	-3.4
State & local government	-3.9	-1.2	0.8	19.0	2.4
Exports	59.6	21.8	6.7	7.9	7.4
Imports	93.1	29.6	11.5	9.5	8.4

Source: IHS Markit © 2021 IHS Markit

Key indicators

Percent change	2020	2021	2022	2023
Industrial production	-6.6	7.4	4.1	1.9
Payroll employment	-5.7	2.4	3.4	1.8
Consumer Price Index	1.2	2.2	1.5	2.0
Core CPI	1.7	1.7	1.9	2.1
Brent crude oil price (USD/barrel)	41.8	62.2	60.2	61.4
Federal funds rate (%)	0.38	0.08	0.09	0.10
10-year Treasury yield (%)	0.89	1.45	1.81	1.99

Source: IHS Markit © 2021 IHS Markit

North Dakota State Economy

A slow recovery for North Dakota following shocks from the COVID-19 pandemic and oil-price drops

- In the fourth quarter of 2020, employment climbed by 2.6% (annualized). Although the last half of 2020 showed growth in employment, it was coming off of very low levels from the second quarter of 2020. Despite strong growth, employment remains 6.9% below the pre-pandemic 2020Q2 levels. Because of the huge drop, it will likely take more than a year to make up the deficit.
- North Dakota began experiencing spikes in caseloads of COVID-19 over late June which remained on an upward trajectory through early November. On November 13th, the state issued a mask mandate and social distancing orders. The order coupled with the vaccine roll-out has brought down caseloads in North Dakota. With the exception of November and December, job growth has remained positive every month from May 2020 to January 2021.
- Low oil prices stemming from the pandemic and declines oil demand plagued the economy in North Dakota in 2020. In the second quarter of 2020, the West Texas Intermediate (WTI) price had plunged to $28/barrel. By the end of the year, prices firmed up to above $42/barrel thanks to rebounding demand and lower production levels.
- Driven by the broad vaccination campaign, the WTI is expected to have a faster recovery than in the previous forecast. By the end of 2021, the WTI will climb to over $57/barrel. Although oil production in the Bakken will stay below pre-pandemic levels for some time, upstream activity will ramp up again as soon as it's profitable to drill.

North Dakota's economy will be driven by the performance of the US oil industry in the near term

- The global pandemic threw oil markets into a tailspin in 2020. From October through early November, rig counts in North Dakota fell to 10-11 rigs – half the amount as the worst week during the 2015-2016 correction. The fallout will remain over the next year or so as upstream companies reduce capital expenditure budgets.
- The timing of the eventual recovery will depend on several factors, including the pace of the vaccine rollout. The recession was a short one but was deep, and a full recovery hinges on when COVID-19 can be reliably managed and oil demand returns.
- Looking further ahead, North Dakota's economy will trail the US on the whole. Employment in the state will climb an average 1.2% annually through 2025 compared with 1.9% for the United States.
- The oil downturn will slow the initial COVID-19 recovery and thus weigh down average growth in the period. Indeed, it has been a roller-coaster ride of sorts for the North Dakota economy, with high-flying growth during 2010–14, then a steep plunge in 2015–16, followed by a gradual climb back up until the economy hit another wall in 2020.

The energy industry is a double-edged sword for North Dakota's economy

- Despite low oil prices we remain optimistic about the longer-term prospects for North Dakota's energy industry. It was a very challenging time over 2015–17

and additionally will be in 2020–21. But the Bakken will remain a viable play, albeit not at the heights of the Permian, once oil prices recover.

- The western part of the state remains heavily dependent on the Bakken formation and the oil industry. However, the metros in the eastern part of the state do not have huge dependence on the oil industry and have made strides in diversifying their economies over the years.
- Besides the in-migration related to the energy boom, the state has had trouble attracting new residents. This limits population growth and dampens overall economic potential.
- The state is quite vulnerable to boom and bust cycles now that it is such a large energy producer. Employment in the state was the second-fastest growing in the country during 2014 but fell to dead last in 2015 and remained among the bottom in 2016 and 2017. The economic growth spurred by the energy industry can be dramatic but so can the declines.

Labor force and demographics

- In 2018, North Dakota was the 47th-largest state by population. The state's total population increased by 0.6%, to 760,000. This is well below the 2.0%-plus average seen during 2011–15 when the state was one of the fastest growing in the nation. The mass immigration sparked by the oil industry was the main driver behind the outsized population growth, and there was payback as oil field workers left the state. Population growth will pick up in the coming years along with upstream energy activity, but it will not get back to the 2011–15 boom years.
- One trend that has not changed is the declining share of the state's population living in rural areas. North Dakota had been losing rural population steadily since 1984, with rural residents' share of the total population decreasing from 66% in 1975 to 56% in 2000. Most of this decline was during the 1980s farm crisis, when both rural and metropolitan areas saw residents relocate to other states. More recent data from the decennial census show that in 2010 this share fell further, to 52%. Although this population decline has recently decelerated, due largely to the influx of people to rural northwestern North Dakota for the Bakken shale play, it is still under way because of ongoing migration from rural areas to the state's metropolitan areas such as Fargo and Bismarck.
- North Dakota boasts a well-educated work force: its educational system has one of the nation's highest percentage (93%) of ninth-graders who go on to graduate from high school; the national average is 88%. In addition, the state has a significantly higher proportion of population possessing at least an associate's degree, which stood at 44% in 2017, in comparison to the national average of 41%.

Economic structure

- North Dakota has one of the smallest concentrations of industrial jobs in the country. In all, manufacturing firms make up just 6% of nonfarm employment, versus the national average of 9%. Industrial activity is driven by a few segments: agricultural and construction machinery; food products; printing and publishing; transportation equipment; fabricated metals; and stone, clay, and glass.

- Agriculture has a large influence on the state's manufacturing economy, affecting local agricultural machinery manufacturers, as well as transportation providers. Major local manufacturers include Melroe/Ingersoll Rand, Imation, Marvin Windows, and American Crystal Sugar.
- The most notable economic change is the recent explosion of growth in the energy sector due to the Bakken shale. While the mining and natural resources sector still accounts for only 5.0% of North Dakota's total nonfarm employment, this is up from just 1% 10 years ago. Although the Bakken shale region has experienced quite a boom since the mid-2000s, the low-oil-price environment that emerged in late 2014 and has continued through 2015 and 2016 has led to a dramatic decline in upstream energy activity although the longer-term prospects remain relatively bright for the Bakken play.
- Fargo generates almost one-third of both jobs and gross state product. The metro area serves as a center for farm-related trade, distribution, and manufacturing, and has a large service sector that is highly concentrated in the healthcare and other knowledge-based industries. Fargo's low-cost structure makes it ideal for the back-office operations of many financial services firms, including Wells Fargo.

III. Special Industries

Oil

North Dakota's oil production sectors have grown significantly in their importance to the state's economy over the past 12 years. As state legislation has been updated to better reflect this industry's importance and improve capture of related revenue streams in royalties from extraction and production, accuracy of future oil and gas activities is essential for stable budget projections. Indeed, the capital expenditures for drilling and completing new wells are a key input for IHS Markit's tax revenue forecast model.

IHS Markit maintains a forecast of global oil prices and production, and updates models each month, and releases a formal production forecast each quarter, to stay abreast of changes among operators and within the industry. Within the US, oil and gas are forecasted by major producing plays, including the Bakken/Three Forks Shale play. IHS Markit's forecasts are coordinated across multiple departments and include the following:

- The commerciality of each US play as reflected in its cost of supply
- The incentive and ability of producers to develop resources within these plays
- Historical and current activity in each play, such as rig counts and reported production volumes
- Global energy outlook and projections for energy demand
- Activities of oil producing countries, including OPEC+ (herein defined as OPEC and Russia)
- The role of alternative energy sources such as natural gas and renewables
- Worldwide events and conditions that can impact the global energy demand, such as COVID-19 and the subsequent recovery in the economy and global demand increases
- Refining and marketing

In conjunction with the oil and gas forecast, a supply-demand balance is formulated, and a price outlook is generated.

Global Oil Market Fundamentals:

Global oil markets have improved, setting the stage for a slow improvement in commodity prices. Factors contributing to a short-term improvement since the March-April 2020 oil market crash include:

- A recovery in oil prices based on improved market fundamentals and massive economic and financial support from monetary authorities in the United States, Europe, Japan, and mainland China, and
- Record production cuts by Saudi Arabia of up to 4.5 MMbbls/d and its OPEC+ partners, along with drilling curtailment and production shut-ins in North America and elsewhere, which have also played a pivotal role in accelerating the rebalancing of markets.

As of March 2020, we estimate that global liquids demand has reached about 93% of the level of a year ago, led by recoveries in Mainland China, the United States, and

Europe. While there is more clarity about what will define the path of the world economy and the oil market in the latter half of 2021, much uncertainty still remains about the future direction of oil prices and world oil demand. This uncertainty is driven by the degree to which COVID-19 is contained or not. OPEC+ decisions to continue production cuts, business and tourist travel, and other variables will be shaped by this one overarching factor, which means that until COVID-19 is contained (which includes a sustained decline in new cases and/or when whole populations are vaccinated), the oil market recovery will be fragile and vulnerable to reversals.

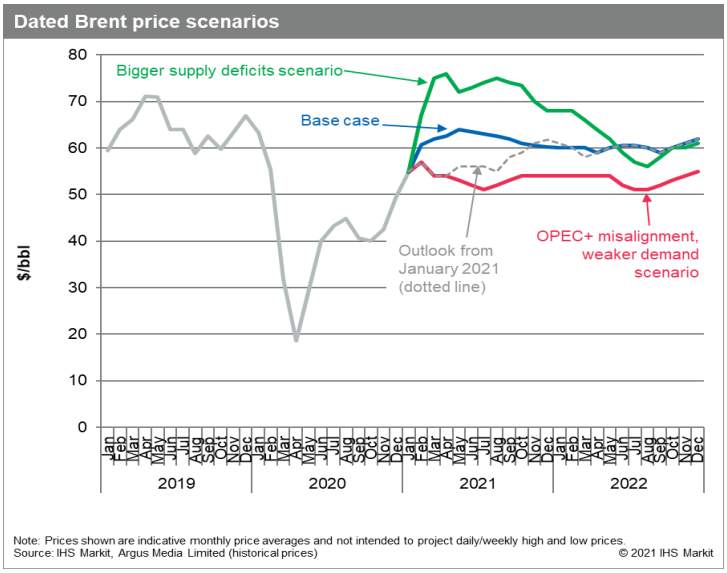


Figure 3-1: supply and demand surpluses and deficits

Figure 3-1 illustrates the range in short-term oil price recovery driven by the uncertainty in how COVID-19 is likely to play out in the months ahead. IHS notes, however, that the overall short-term outlook in prices has improved considerably since December. Inventory drawdowns, increased demand and a brighter prognosis regarding COVID-19, have elevated our base case outlook. Currently WTI oil prices are in the low $60 range and are expected to continue for the first half of the year. The high case reflects possible short-term inabilities to meet demand, due to the massive decrease in spending during 2020, which situation is likely to be corrected during the following year. The low-price outlook suggests a $50 floor which OPEC+ is likely to maintain going forward.

Recent announced cuts of 1 million bbls/day by Saudi Arabia have provided a recent boost to prices with announced cuts projected to continue through May of this year; however, future cuts by Saudi Arabia may be eased in the future as prices continue to strengthen. Currently they are holding ~4.5 MMbbls/day off the market which when added back-in could substantially affect the price outlook.

Current price gains should be able to be sustained, but future OPEC+ supply will likely limit the momentum and keep the price in the $60 to $65 range in 2021 with slight decreases in 2022. West Texas Intermediate (WTI) will average about $2.50 to $3.00 lower. Other factors that are likely to put downward pressure on prices include the possibility that OPEC+ unity would begin to fray at prices above $60/bbl, as well as continued high inventory and spare capacity levels.

Long-Term Oil WTI and Bakken Price Forecast

While the ongoing crude supply recovery is mixed for North America, we expect that abundant worldwide supply and anemic demand growth will keep oil prices in the $55-60 realm (constant dollar – no inflation) through 2030 and beyond (see Figure 3-2). The nominal price increases reflect a long-term inflation rate of 2.5%. This WTI pricing

projection reflects a barrel netted back to Cushing. The long term WTI pricing complex (Houston, Cushing, and Midland) will remain at an export discount of about $2-3/bbl relative to Dated Brent.

Due to the historical transport constraints, Bakken/Clearbrook price differentials to WTI have been priced negative, however, due to the plentiful take-away capacity* to the Midwest and Gulf Coast refining markets, and projected improvement in gas and water management, Bakken/WTI differentials are forecasted to be slightly higher in the future.

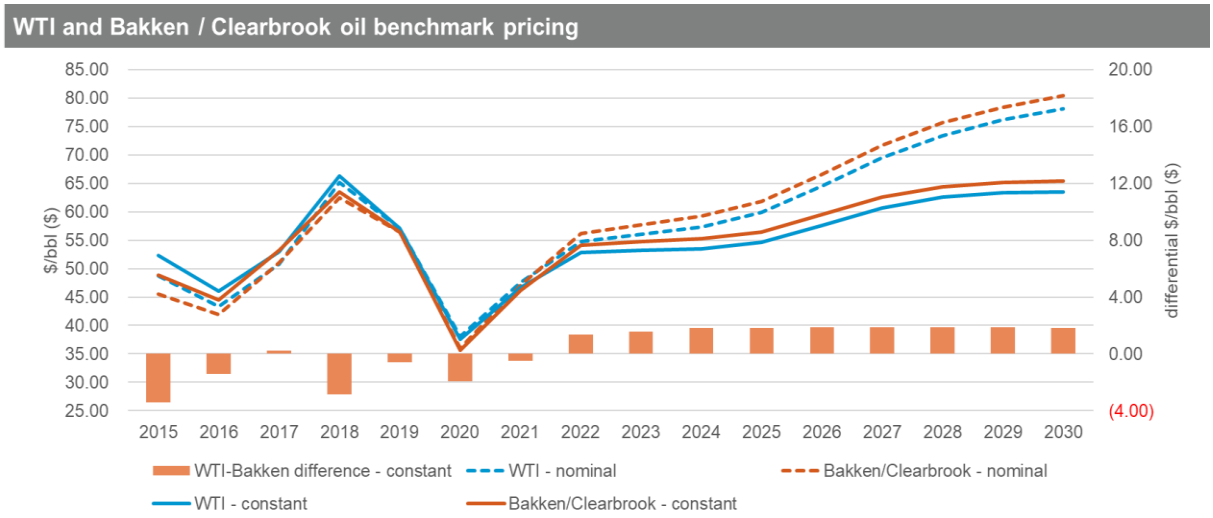


Figure 3-2 long term WTI and Bakken oil price forecasts

**These assumptions assume that transport via Dakota Access pipeline (DAPL) will continue relatively uninterrupted; however, should interruption occur, a significant negative differential will occur during shutdown (see discussion at the end of this section)*

US Base Case Drilling and Production Forecast

In May 2020, US crude production bottomed out at 9.8 MMbbl/day and has increased over since that time, primarily due to shut-in volumes being reactivated. However, 2020 saw a year over year drop of nearly 1.5 MMbbls/day. During that same period, oil prices stabilized at the low $40/bbl level, triggering the restart of well completions, which were halted in May and early June. Over the next two years, production is expected to grow only slightly as production from new wells is expected to largely replace declining production.

In addition to a lower oil price forecast, operators are likely to spend less on drilling in the years ahead. North American liquids-focused operators reduced their 2020 budgets by nearly 50%, and future spending decisions will dictate US supply trends through 2021. Before the price collapse, capital budget trimming was

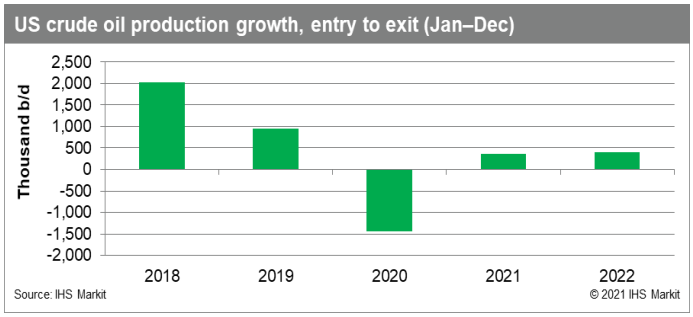


Figure 3-3: US production decline and growth

already underway as producers were being forced by the investment community to spend within their means, and access to borrowing capital had greatly diminished. The decrease in cash flows brought on by lower commodity prices greatly exacerbated this spending reduction trend, which will likely continue even when prices recover to the mid-$60/bbl level. We anticipate that through 2021, operator caution will keep investment levels above 2020, but well below that of 2019.

Current production cuts reflect the overall pessimism in the global energy demand as longer-term price projections have also been reduced. Likewise, the US production and drilling forecasts have decreased from what they were at the beginning of 2020 due to the sudden drop in drilling and production and lowered expectations of future cash-flow to be generated by upstream assets. The more recent long-term US forecast suggests that while the commercial below ground resources remain abundant, it will require more years of drilling at a slower rate to produce them.

Bakken Forecast

The shorter-term Bakken drilling and production history and forecast reflects the overall situation in the US, where a sudden drop in drilling activities in March-May 2020 was followed by a modest activity gain into 2021. The number of wells completed dropped from approximately 100-120 per month in January-March to less than 20 in May. Base case wells, while currently at the mid 60 per month range, (including DUCs) will increase modestly throughout the year fueled largely by DUC (drilled uncompleted) wells. The longer-term outlook calls for approximately 80 to 100 monthly well completions, which will help maintain production in the 1.2 to 1.5 MMbbl/day range in the Base scenario (figure 3-4).

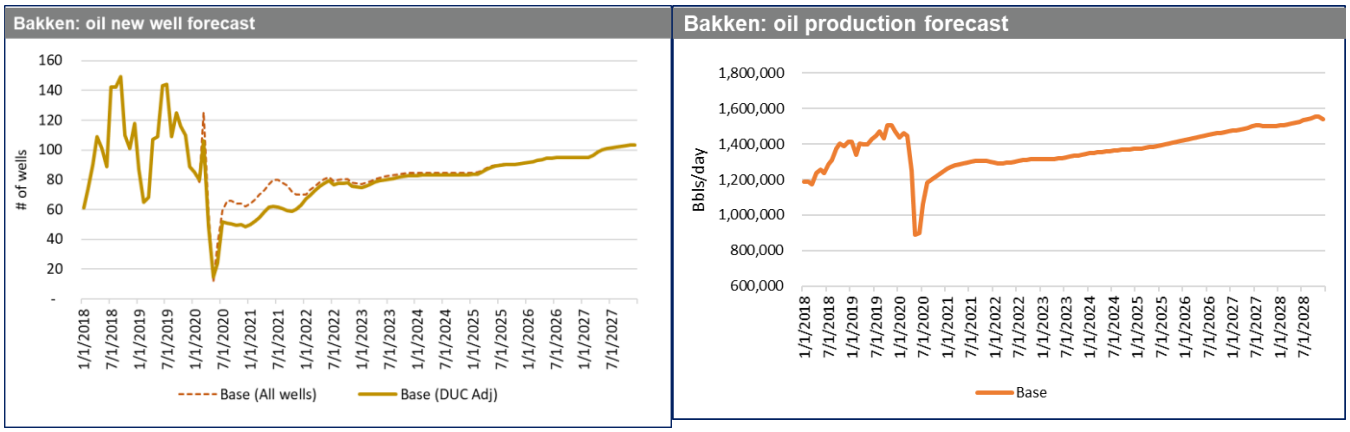


Figure 3-4 Comparison of February 2020 and current drilling and production forecasts

Recent production history reflects (1) wells being shut in and then reactivated and (2) a significant decrease in new well completions. The rapid recovery of July through September is attributable to shut-in wells being reactivated, whereas, the future outlook will depend on the number of new well completions.

Due to steep initial decline rates, new well completions must occur at a rapid rate just to maintain current production rates. In some years, well completion rates may exceed declines resulting in slightly increased production levels, whereas a decrease in well completion rates, such as occurred this past year, results in notable production

decreases. The Bakken trend requires about 65-70 monthly well completions to maintain production rates of about 1.2 MMbbl/day; hence the sudden decrease in well completions was partially responsible for the drop of about 200 Mbbl/day to the current rate of about 1.25 MMbbls/day.

Determining the number of recent historical well completions can be challenging, given reporting lags, multiple sources, and the contribution of DUC wells. IHS monthly totals for late 2020 are higher than that indicated by the North Dakota Directors' Cut (figure 3-5); nevertheless, both suggest a large contribution of DUC wells. In 2020 we estimate that ~367 (44%) of the ~840 new wells brought on-line during the year were DUC wells.

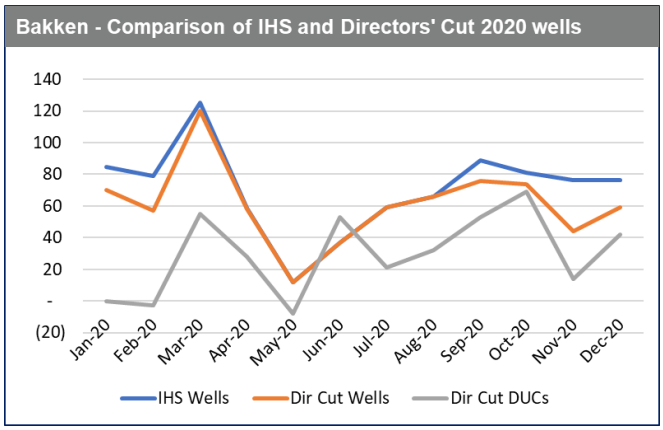


Figure 3-5: New wells coming on stream in 2020

IHS Markit projects that in the base case, about 44% of new well completions from 2021 through 2022 will be DUC wells. By that time the DUC inventory of 668 at the end of 2020 will be exhausted. Since a DUC well only requires about 65% of the capital that a completely drilled and uncompleted well requires, operators are likely to rely on this inventory to maintain production levels until DUC exhaustion is reached. This reduced contribution of the DUC inventory is built into future revenue projections.

As mentioned previously, the surge in production during the July-September time frame is due to shut-in wells coming back on-line. Back in April-May 2020, well shut-ins of nearly 500,000 bbls/day, spanning from a severe shortage of storage capacity and market access, were a major contributor to the sudden production drop in Bakken production. Even with low rig counts of 14-15 seen during the latter half of 2020, the current surge in production is due to most of the shut-in wells being reactivated. In December 2020, there were 15,798 actively producing wells in Bakken, which is ~97% of the number of wells producing in March.

Bakken Resources

The Bakken/Three Forks could begin to face well inventory exhaustion of core areas within the next decade, although the projected slowdown in drilling activity largely allays some of these short-term concerns. The current outlook is likely to push the time frame of inventory exhaustion back several years. Nevertheless, available drilling inventory is likely to emerge as a pressing concern over the longer term and has to be integrated into the forecast.

Figure 3-6, which provides a view of the entire Bakken play, shows that core areas have been heavily drilled and some acreage has been completely drilled out.

To date, a total of about 15,835 wells have been drilled in the play. While IHS Markit estimates that there are potentially 55,000 – 60,000 remaining locations, many are not commercial. Current breakeven prices (WTI- $/bbl) for quintiles of currently producing wells help us determine where and how much drilling will occur at given forecasted prices and are listed below:

- Quintile 1 - $35.88 – 1440 locations
- Quintile 2 - $45.20 – 4726 locations
- Quintile 3 - $55.92 – 7745 locations
- Quintile 4 - $62.84 – many locations
- Quintile 5 – $80.56 – many locations

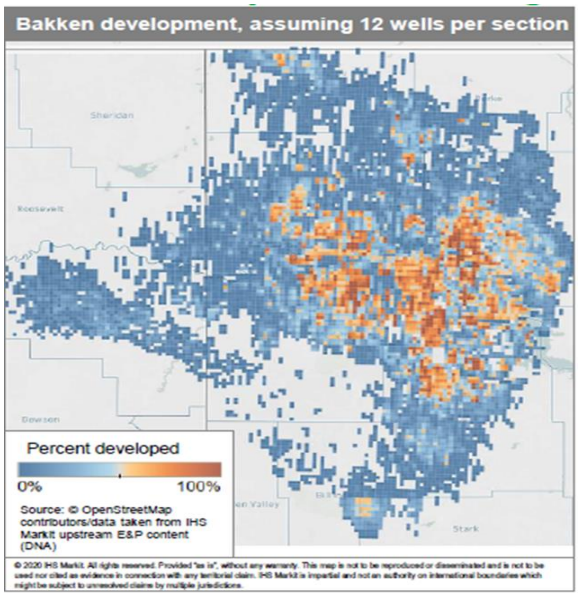


Figure 3-6 Bakken well development, including core areas

While we are keeping an eye on possible sweet spot exhaustion, our analysis indicates that there are still sufficient numbers of Quintile 1 to Quintile 3 remaining locations (which breakeven at or below forecasted prices) to contribute to our forecast through 2027.

Alternative Price Forecasts Underlying Low-Base-High Drilling and Production Forecasts

Uncertainty regarding the recovery from the COVID-19 pandemic and the disposition of Saudi Arabia's 4.5 MMbbls/day of shut-in production contribute to a broad range of short-term price forecasts. For the Base case, IHS Markit assumes that effective COVID-19 vaccines are available in mid-2021, which will stimulate an economic recovery through 2021 with global economic growth averaging 5.0% in 2021 and 4.2% in 2022. As economic activity improves, oil demand will also recover gradually. With this in mind, the most recent short-term price forecast anticipates that

- Global oil demand, at 93–94 MMb/d in fourth quarter 2020 and first quarter 2021, will grow by 5 MMb/d by third quarter 2021, driven by a broad vaccination campaign.
- After production cuts through May of 2021, Saudi Arabia raises output along with other OPEC+ producers during the rest of 2021.
- US crude oil production grows 0.3 MMb/d between the first and fourth quarters of 2021 and 2022 each—far less than the 1.0 MMb/d growth during the same period of 2019.
- While US operator will be returning more cashflow to operators, upstream capex in 2021 is down only 33% compared with that in 2019

- Demand gets to pre-pandemic levels only by end-2022
- The easing of sanctions under US President Biden results in Iranian production rising to 2.7 MMbbl/d in 3rd qtr. 2021 and further to 3.4 MMbbl/d in 4th qtr. 2022

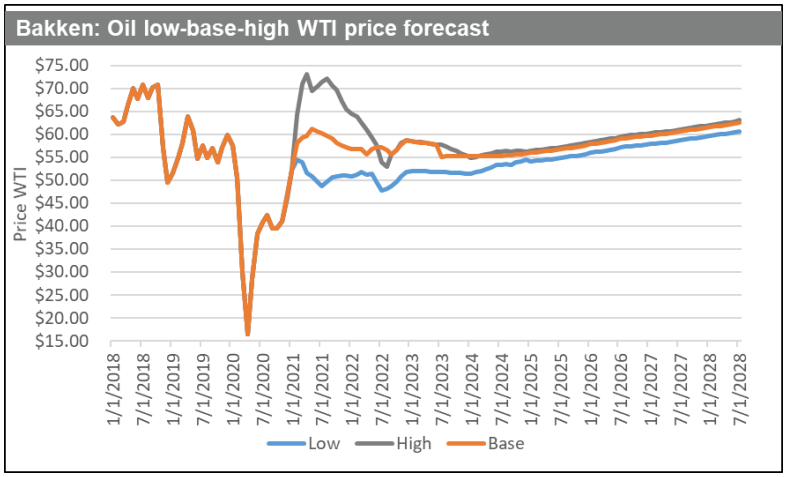


Figure 3-7: Price forecasts based on recovery from COVID 19

A higher price outlook is contingent on a faster than anticipated recovery from COVID-19, which will result in stronger demand growth and bigger supply deficits in late 2021 and early 2022. Enthusiasm related to hopeful vaccines and rapid declines in new COVID 19 cases are likely to lead to business and international travel recovering faster than expected in 2021. Higher prices will result from temporary shortages in 2021, but thereafter price will drift downward and converge with the base price forecast as the market supply adjusts.

Weaker demand will drive the lower price outlook which would result from COVID-19 cases remaining high throughout 2020 and into 2021. Nevertheless, this case also reflects the reluctance of OPEC+ to drive prices lower in order to retain market share. In effect they are likely to maintain a $50/bbl price floor or greater over the longer term. Once the world gets past the pandemic, we expect that prices will slowly rise converging with the base case in 2024 (figure 3-9 and table 3-2).

Year	Low Price	Base Price	High Price
2020	$ 36.37	$ 36.37	$ 36.29
2021	$ 51.23	$ 58.59	$ 68.08
2022	$ 50.25	$ 56.88	$ 58.72
2023	$ 51.79	$ 56.67	$ 57.39
2024	$ 53.05	$ 55.42	$ 55.92
2025	$ 54.81	$ 56.71	$ 57.19
2026	$ 56.93	$ 58.84	$ 59.31
2027	$ 58.64	$ 60.54	$ 61.01
2028	$ 60.52	$ 62.42	$ 62.90

Table 3-1: Average annual WTI price forecast

Low-Base-High New Well Forecast

Alternate forecasts of new well completions are based on (1) the low, base and high price forecasts, (2) the amount of available cash flow being spent on capital expenditures, (3) the availability of quality locations in the Bakken/Three Forks drive and (4) possible shut-down of DAPL.

Figure 3-8 compares percentage of cash flow that operators are likely to spend on capital expenditures for drilling and completing new wells. These percentages are similar for each of the cases and consider that operators will return a significant portion of the cash flow back to investors. For example, in late 2020 through 2022, operators will use only about 50%of cash flow for capital investment, which will rise to an

average of about 60% over the longer term. This amount is lower than what we have seen historically. The spike in March and April is attributable to much lower cash flows due to the price collapse, and while fewer wells were drilled during that time, the capital expense still exceeded cashflow.

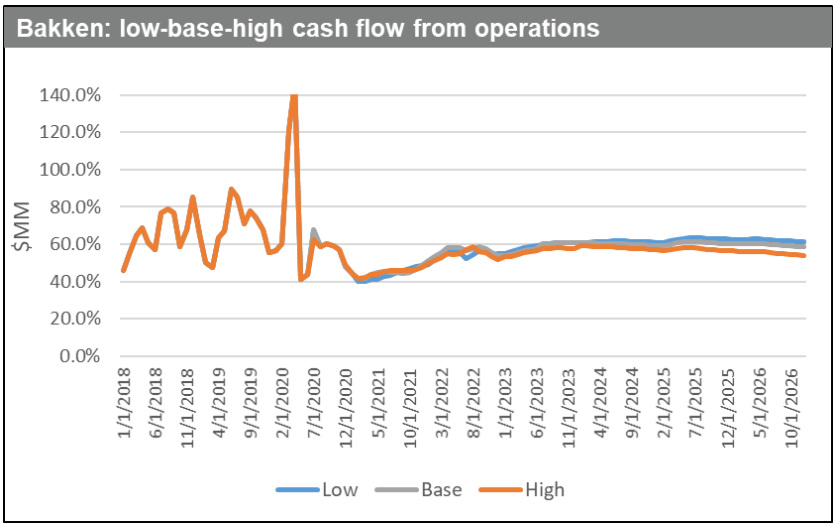


Figure 3-8: comparison of percent of cash flow used for Capex

As mentioned previously, breakeven prices for remaining locations are also an important driver of incentive to drill and complete wells. There are more than Quintile 1 and 2 remaining locations that breakeven below $46/bbl, with an additional 7745 Quintile 3 locations that breakeven at under $56/bbl.

Breakeven prices suggest that when the oil price reaches the high $50's/ bbl, almost 14,000 wells (Quintile 1 – 3) become economic and higher levels of activity will occur. While contributions from all three quintiles will be required to fulfill the forecast, the total wells for all three forecasts, are well within this range. The high case total through 2027 is about 9000 wells,

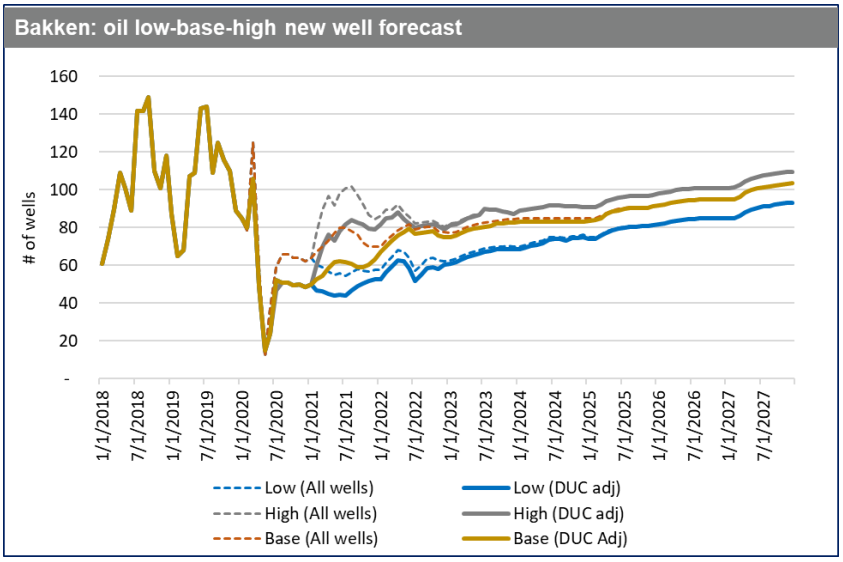


Figure 3-9: Drilling forecast for low-base-high cases

Figure 3-9 displays the forecast of number of wells completed each month through 2027. Increases in new well completions are a direct response to prices increasing to the $60+/bbl range. For example, when responding to a higher price forecast there is an increase in new wells to around 80 by mid-2021. Table 3-2 provides annual well totals for each forecast case.

Another factor that could influence the drilling forecast toward the lower outlook would be the shut down of the DAPL as more oil would have to be transported by rail, which in effect would lower the realized price outlook (see detailed discussion at the end of this section).

Capital expenditures for the low-base-high new well forecast cases underlay tax model forecast cases. This well completion forecast includes all wells that are put into production including approximately 668 DUC wells. In general, the amount of capital expenditure attributable to drilling and completion is approximately 30% for drilling, 65% for completion (fracking) and 5% for facilities and artificial lift. In order to better reflect capital expense, the well counts which are used in the tax models have been adjusted (DUC adj) by using the formula:

new drills x 1 + DUCs x 0.65 = DUC adj

To further clarify Figure 3-11, the total number of wells, including DUCs is shown with a dotted line for each case, and the adjustment in well counts indicated by reducing the DUC portion of the forecast is indicated by the solid lines.

Year	Low Price	Base Price	High Price
2020	660	660	660
2021	570	703	895
2022	693	903	990
2023	792	956	1,035
2024	869	997	1,089
2025	942	1,060	1,140
2026	1,007	1,128	1,201
2027	1,078	1,201	1,274

Table 3-2: Total number of wells (DUC adj.) completed annually

Low-base-high production forecasts

For the high case, oil production in the Bakken/Three Forks is forecast to begin increasing rapidly in 2021 and then increase more gradually reaching pre-pandemic levels of 1.4 MMbbl/day by 2024. The base case will begin to recover more slowly and reach the pre-pandemic levels by 2026. The base forecast will follow a similar track as the high case, albeit at a rate of about 150-200 Mbbl/day lower. The low case predicts a slight decline in production until 2023, when it bottoms out around 1200 Mbbl/day and gradually increases thereafter (see Figure 3-10).

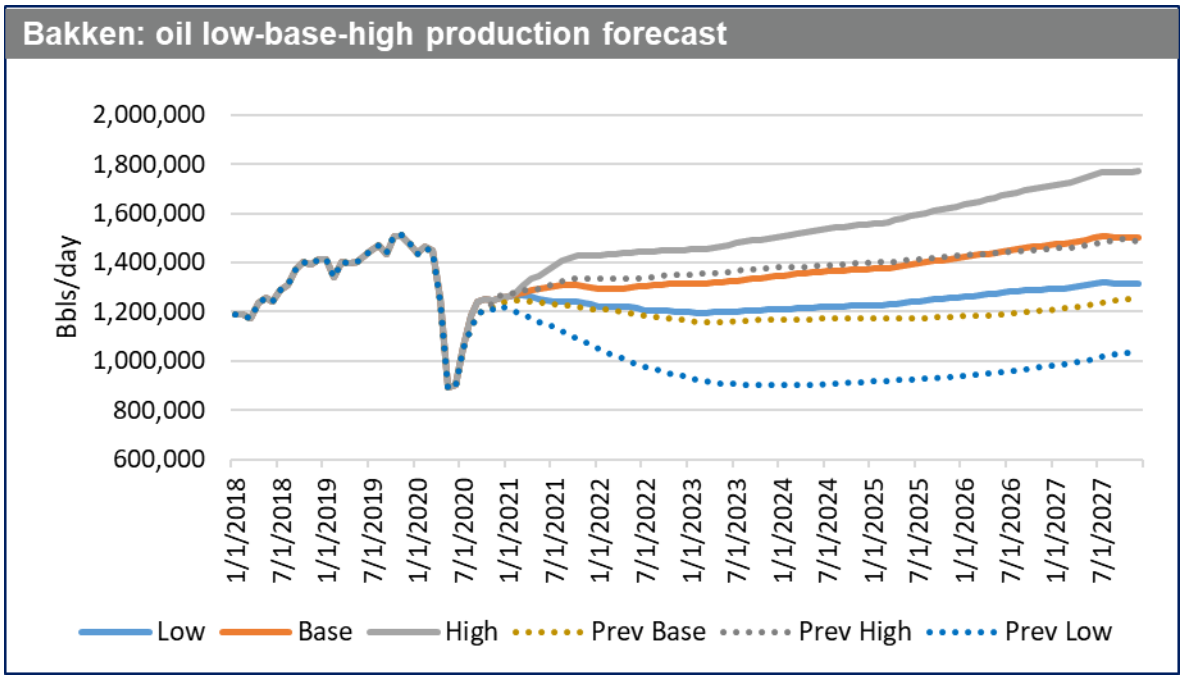


Figure 3-10: Production forecast for low-base-high cases

The substantial increase in all three price outlooks has had a large increase in the drilling and production outlooks with production commensurate increased outlooks for

all three cases. This again, clearly demonstrates the effect of prices on both the economics of drilling and the cash flow available for increased drilling and completion. Historically 95 to 100 wells were required to be completed each month to increase and maintain production at 1.4 to 1.5 MMbbls/day. To maintain constant at specific production levels, it will require the number of well completions listed as follows:

- Low case: 65 – 75 wells to maintain 1.2 – 1.3 MMbbls/day
- Base case: 75 – 85 wells to maintain 1.3 – 1.4 MMbbls/day
- High Case: 95-100 wells to maintain 1.4 – 1.5 MMbbs/day

Changes in the price forecast and drilling forecast since September

Figure 3-13 provides insight into how the price and drilling forecasts change since we presented this outlook in January 2021. At that time, we had predicted lower price outlooks and lower well forecasts. Recent increases in WTI have infused optimism into the markets to the point that prices are now at pre-pandemic levels. Continued production cuts by Saudi Arabia and an optimistic outlook at COVID-19 recovery have also influenced upward revisions in all three cases. Previously, we forecasted that prices would increase gradually through 2021; however, current WTI prices are now above those late 2021 price points and expected to be maintained throughout the year.

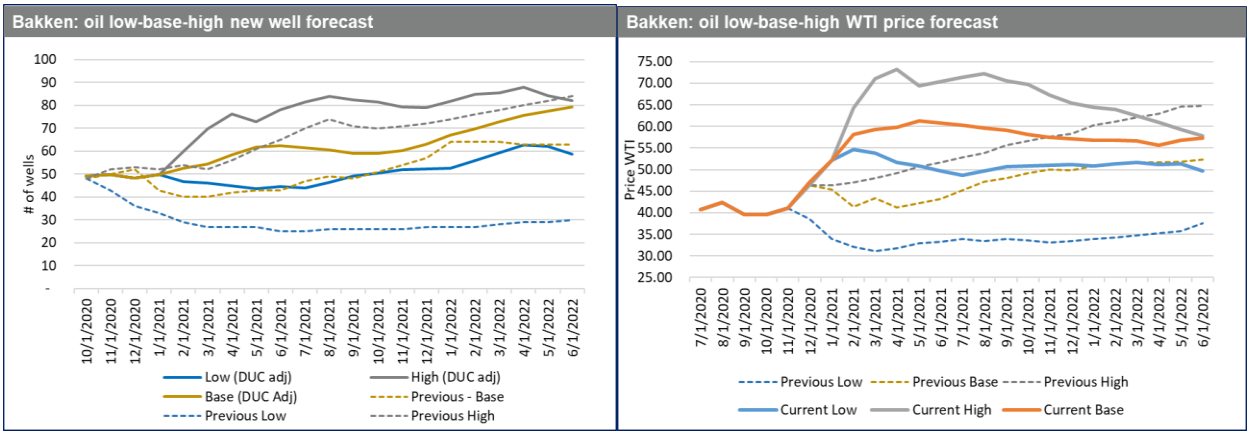


Figure 3-11 Comparison of previous 2020 and current WTI and drilling forecasts

COVID-19 and increase in the latter half of the year.

Adjustments to the base drilling and completion forecast also coincide with these similar modifications in the base case price forecast, with an expected systemic recovery in new wells to begin immediately. Likewise, the price outlook increases between the high and low-price forecasts is also reflected in the increased range between the high and low new well forecasts.

The Dakota Access Pipeline

IHS Markit's price, drilling, and production forecasts are built around an assumption that the Dakota Access Pipeline (DAPL) will remain open for oil takeaway to midwestern markets. Today, the DAPL provides the biggest outlet for Bakken crude, and the loss of its 570,000 bbls/day takeaway capacity would put downward pressure on production. On 6 July, US federal judge ordered to shut down the DAPL within 30 days, as the court

had earlier ordered a new environmental review of the project. In August 2020, Energy Transfer, the operator, obtained a temporary stay on the shutdown order while the case is being appealed.

Unfortunately, On January 26, the DAPL lost a key court appeal, which greatly increased the risk that the pipeline might be shut-down, at least for a period of time, until the Army Corps of Engineers provided a more complete environmental impact assessment of the Missouri River crossing easement. Currently this federal easement is technically "null and void" and the Biden Administration could elect to shut down the pipeline for this cause. Furthermore, there are also pending court cases filed by the Native American tribes that could also cause possible future shutdowns.

The DAPL has been running near capacity, transporting more than a third of all Bakken production. Most other pipelines out of the region are smaller and have also been running at high utilization. Some of the DAPL barrels may shift to these pipeline systems moving crude through the Rockies; however, the remaining oil would move by rail if the DAPL is shut down by court in 2021 (see Figure 3-12). Bakken producers would likely have to accept lower wellhead prices for their crude in order to cover the higher transportation cost of moving more crude by rail.

Bakken output is down more than 250,000 bbls/day from its peak of 1.5 MMbbls/day as producers have been bringing shut in wells back on stream. An adverse DAPL decision could motivate producers to delay drilling, although over the longer term, legal issues are likely to be resolved. IHS Markit currently projects a positive differential of $1-$2 of Bakken-Clearbrook to WTI based on our view that the DAPL will stay open; however, if the closing of the pipeline persists, some Bakken crude is likely to be penalized by up to $9/bbl for rail transport. While it is difficult to project the outcome, we could see as

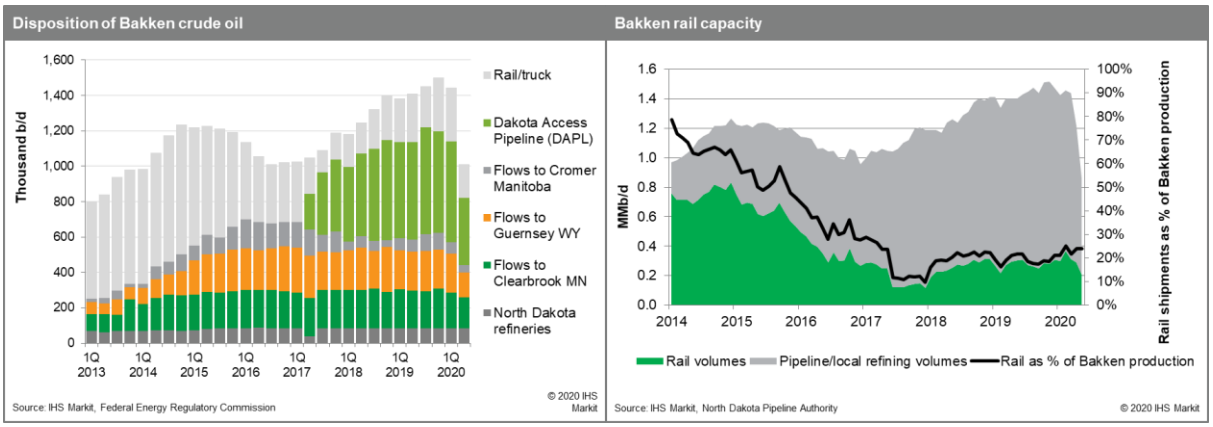


Figure 3-14: Bakken/Three Forks pipeline takeaway capacity and rail capacity

much as 50-60% of Bakken oil transport by rail, which may raise WTI differentials to pre-DAPL levels of $5-$8 dollars. This rise could in-effect, could shift our base case drilling forecast toward the low case outlook.

Other matters

New Biden Administration Restrictions on Federal Lands: Some increased federal restrictions such as fracking bans, slow walking permits and increased environmental regulations are likely to occur due to the change in administration. While many of these will be challenged in court, this is nevertheless a matter of concern. Although there are

virtually no BLM lands within North Dakota's Bakken trend, a portion of the core area is occupied by the Fort Berthold Indian Reservation. Historically the Bureau of Indian Affairs (BIA) works with the BLM in managing these lands which include resource evaluation, approval of drilling permits, mining and reclamation, production plans, mineral appraisals, inspection and enforcement, and production verification.

Normally lands managed by BIA and the BLM would incur similar restrictions since these agencies work in cooperation. However, indications are that lands managed by the BIA, including the Fort Bertrand Indian Reservation, would be an exception to recent permitting and leasing restrictions imposed by the Biden administration. IN other words, IHS believes that for the time being, operations will continue "business as usual" for the time being on the Fort Bertrand Indian Reservation.

Access to waters of the US (WATUS): Concern has been raised about access to water for fracking. While overall water use for fracking is small compared to many other industrial and agricultural uses, concerns about expanding the definition and limitation of water use could nevertheless impact the water source for fracking if a hostile administration chose to do so. IHS Markit view is that Changes to the definition of "Waters of the US" under the Clean Water Act and related regulations are likely to clarify and expand the definition of water bodies under federal jurisdiction and require oil companies and farmers to obtain permits for water discharge from point sources. Water use permits will not be impacted and will continue to be issued by the North Dakota State Water Commission.

Agriculture

IHS Markit's recent US acreage forecast indicated that market prices, at levels not seen in several years, would incentivize US producer this year to plant fence row to fence row, figuratively speaking. Corn plantings will rise to 94.2 million acres, soybeans at 90.1 million acres, all wheat at 45.3 million acres, rice at 2.83 million acres, cotton at 11.5 million acres, and sorghum at 7.2 million acres. Including all other minor crops, total US plantings in 2021/22 will jump from 310.4 million acres to 322.2 million acres. The last time area mimicked this was in 2014/15 when total plantings settled at 326.9 million acres.

Costs for the US crop producer had been on a downward trend as grain and oilseed prices retraced to levels not seen since pre-2012 along with global raw material costs such as energy, which retraced levels deemed impossible during the 2008 bull run. Furthermore, the US producer has been gifted with record low interest rates and for the most part trend line production. Over the years this has been beneficial for balance sheet values as low interest rates and government stimulus, since the initial round of MFP payment was sent out, have been bid right back into land values and supported the continuation of farming practices in 2022. The US farmer has received large amounts of stimulus, has seen a rise in crop prices, and is slated to receive more stimulus in 2021 of $13 billion. All levels of the crop input sector will benefit from this. Equipment sales have been stronger and fertilizer prices are on the rise. Costs of production are expected to rise in 2021 for all crops in our forecast driven by most categories less fuel lube and electricity. In the case of corn and soybeans, our forecast shows a healthy crop size in 2021 that will help to drive down commodity price in the 2021/22 marketing year. However, we do not expect costs to fall quickly in 2022, as in the past these cost increases stick around for a few more seasons.

The first-quarter livestock forecast for 2021 shows expectations for relative price stability relative to the massive swings in supply and demand during the initial COVID-19 impacts of 2020. However, despite the anticipation for ultimate price stability this year, a number of risks still remain for both supply and demand. Although production continues to hold firm overall, with plants projected to sustain and improve capacity as time passes, sudden disruptive shutdowns remain a possibility.

Domestic demand fluctuations have occurred owing to the influences of lockdowns and quarantines, reducing food service. Even with attention focused on recovery through vaccines and policies, expectations of rising demand remain out of focus. With the timing and magnitude of rebounding consumption still unclear, a slow or sudden shift could mean respective price swings for livestock, similar to the ones that occurred in 2020, although to a less drastic degree.

US farm income

Net farm income has been revised higher to $120.6 billion in 2020 and revised higher to $104.5 billion in 2021. The bullish price move in grain and oilseed prices has led to this increase. As a result of our higher price path in the short term, ARC and PLC farm bill payments have been reduced.

US Net Farm income jumped 28% in 2020 and was the 4th consecutive year of increases and the highest level since 2013. However, that sharp jump in income was the result of

higher prices and record government payments due to supplemental and ad hoc disaster assistance for COVID-19 relief. Government payments to farmers in 2020 were a record $46.5 billion or 34% of net farm income or double the share in a normal year. Government payments are expected to drop off sharply in 2021 and then stay relatively flat through the forecast period. This means net farm income will drop off to more historical levels in the forecast period.

US total cash receipts were at $375.7 billion in 2020, up slightly from 2019 as higher crop receipts offset a decline in livestock receipts. Higher crop receipts for soybeans and fruit and nuts in 2020 more than offset lower receipts for corn and cotton. However, from 2021 to 2025 total marketing receipts are expected to increase primarily because of likely stronger growth in livestock receipts.

On the positive side, farm cash expenses are expected to remain relatively flat from 2021 to 2024.

US Cash Receipts, Government Payements, Net Cash & Farm Income and Cash Expenses(Billion $)										
Item	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021F**	**2022F**	**2023F**	**2024F**
Total Cash Receipts	377.4	358.5	370.4	371.4	369.7	375.7	395.8	399.1	396.4	405.5
Livestock Cash Receipts	189.5	162.7	175.6	176.3	176.0	166.6	170.5	181.4	183.5	188.9
CropCash Receipts	187.9	195.8	194.9	195.1	193.7	209.1	225.3	217.7	212.9	216.6
Government Payments	10.8	13.0	11.5	13.7	22.4	46.5	18.9	7.4	8.5	7.8
Total Cash Income	422.6	399.4	413.2	414.2	426.9	453.1	443.5	435.4	434.0	442.6
Cash Expenses	315.8	303.8	311.9	311.4	317.5	315.8	328.0	327.0	324.3	329.8
Net Cash Income	106.8	95.6	101.3	102.8	109.4	137.3	115.4	108.4	109.7	112.8
Net Farm Income	81.7	62.3	75.1	81.3	83.6	120.6	104.5	90.5	90.6	95.1
Source: IHS Markit									© 2021 IHS Markit	

US farm balance sheet

The US farm balance sheet is expected to stay relatively strong through the forecast period. Farm assets and equity are forecast to grow to record levels in 2024.

US Farm Balance Sheet										
Item	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021F**	**2022F**	**2023F**	**2024F**
Farm Assets (bil $)	2,880	2,914	3,006	3,027	3,075	3,121	3,183	3,255	3,327	3,403
Farm Liabilities (bil $)	357	374	390	402	419	435	436	441	449	459
Farm Equity (bil $)	2,523	2,540	2,616	2,625	2,657	2,685	2,746	2,814	2,879	2,944
Source: IHS Markit									© 2021 IHS Markit	

US Crop Balance Sheets

Soybeans

US soybean stocks are forecast to decrease in 2020/21 because of smaller production. Stocks are expected to continue relatively low in 2021/22 as US soybean exports rebound as a result of the agreement with the US and China. The lower stocks will help boost soybean farm prices in 2020/21 and 2021/22. Prices though are expected to drop in ensuing forecast years as stocks begin to build again as expected larger soybean acres will increase production.

Supply: The bullish momentum in soybean futures has indicated in the IHS Markit January area survey that this year's US soybean crop will reach 90.1 million acres and with yields at 52 bushels per acre, while soybean production for the 2021/22 season will

jump to 4.64 billion bushels. The lingering price strength in the short-term forecast has led to a revision higher in our 2022/23 area outlook for soybeans.

Demand: Even with the soybean price rally, US crush margins have been at levels high enough the crushing industry has not taken their foot off the gas, according to the monthly reports from both the US Department of Agriculture (USDA) as well as National Oilseed Processors Association (NOPA). As a result, the 2020/21 domestic crush forecast was revised higher to 2.2 billion bushels, which is almost 2% larger than the previous season. Although the export forecast is slightly weaker than the previous outlook, the bullish story has not changed with exports estimated to reach 2.25 billion bushels.

Price risk: With a tighter stock level, the average farm level soybean price in 2020/21 was revised to $12.00 per bushel and to $10.50 per bushel in 2021/22. There remains great price risk to the forecast if demand does not slow on the export front. The market will never truly run out of beans, but it is the market's job to curtail demand when participants fear that very scenario. Looking at the stocks-to-use ratio, it would point to soybean futures needing to be closer to $15 rather than $14.0 per bushel. As noted in previous reports, that bullish sentiment has been the wrong position to take since the 2013/14 season as global supplies between the two hemispheres met demand and, in a few seasons, led to a build in global stocks just in the nick of time. The market anticipates large plantings and will need those large plantings to replenish stocks. Any stumble in either area or yields over the next 6 months will awaken the bull once again. The bottom line is that stocks are tight, but there are several months left in the 2020/21 marketing year to shift perceptions.

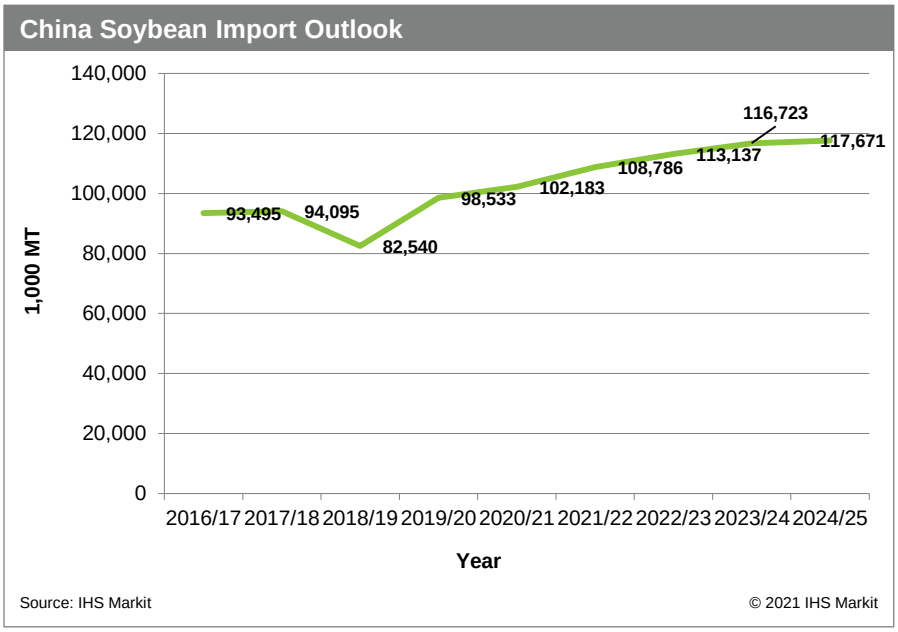
US Soybean Fundamentals

Marketing Year Beginning September 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Prices (Dollars Per Bushel)										
Marketing Year Average Price	9.47	9.33	8.48	8.57	12.00	10.50	10.08	10.35	10.19	9.75
Central IL Processor Price	9.77	9.53	8.53	8.83	12.24	10.73	10.29	10.57	10.41	9.96
Soybean to Corn Price Ratio	2.82	2.78	2.35	2.41	2.61	2.50	2.79	2.74	2.74	2.66
Acreage (Million Acres)										
Planted Area	83.5	90.2	89.2	76.1	83.1	90.1	89.2	87.4	87.6	87.4
Harvested Area	82.7	89.5	87.6	74.9	82.3	89.2	88.4	86.6	86.9	86.7
Harvested Area % of Planted	99%	99%	98%	98%	99%	99%	99%	99%	99%	99%
Yield (Bushels Per Acre)	51.9	49.3	50.6	47.4	50.2	52.0	52.3	52.6	53.1	53.6
Supply (Million Bushels)					0.16					
Beginning Stocks	197	302	438	910	523	106	237	430	525	632
Production	4,296	4,412	4,428	3,552	4,135	4,638	4,621	4,554	4,610	4,646
Imports	22	22	14	15	20	20	15	15	15	15
Total Supply	4,515	4,735	4,880	4,477	4,679	4,764	4,873	4,999	5,150	5,293
Domestic Disappearance										
Crush	1,901	2,055	2,092	2,166	2,200	2,190	2,067	2,051	2,087	2,138
Seed & Residual	146	108	203	105	123	137	138	139	143	146
Total Domestic Disappearance	2,047	2,163	2,295	2,271	2,323	2,327	2,206	2,190	2,230	2,284
Exports	2,167	2,134	1,676	1,682	2,250	2,200	2,236	2,285	2,288	2,356
Total Disappearance	4,214	4,297	3,971	3,954	4,573	4,527	4,442	4,475	4,518	4,640
Ending Stocks	302	438	910	523	106	237	430	525	632	653

Source: IHS Markit

China is the world's largest importer of soybeans and China's imports of soybeans during the forecast period are expected to continue to grow. But export competition

from Brazil is also expected to grow as Brazils exports are forecast to increase by more than 10.0 MMT in the forecast period.



Corn

Supply: The January IHS Markit area survey confirmed initial expectations that the recent rally will entice US corn farmers to plant a few more acres this year. The survey points to initial estimates of 94.2 million acres, up from 90.8 million acres in 2020 and the largest corn plantings since 2016/17. Keep in mind these are expectations and in the past this initial estimate was overruled by spring planting conditions. Nonetheless the profit potential given prices along with the revenue backstop provided by crop insurance will be a rather large bullish carrot. The yield forecast has not deviated from the November forecast staying at 181 bushels per acre but with larger area production has been revised higher by 346 million bushels to 15.66 billion bushels. Obviously at this time summer weather could turn this crop into a 16.0-billion bushel crop or drop it to a 13-billion bushel crop. With our new supply, demand, and price expectations for the 2021/22 season, the US area expectation in 2022 has been revised higher to 91.4 million acres.

Demand: With the smaller crop size the feed and residual use category has reduced this forecast to 5.65 billion bushels for the 2020/21 season. The larger crop size in 2021/22 pushes feed and residual higher to 5.88 billion bushels. Corn for ethanol use has stabilized at 4.85 billion bushels in 2019/20 and rises to 5.05 billion bushels in 2020/21. At this time, we are optimistic that corn for ethanol use will move back closer to our original forecast in 2021/22 with the expectation that US consumers will hit the roads once again. Given the discussions surrounding EV goals here in the United States we would like to reiterate that the IHS Markit automotive group forecast an EV adoption rate, which is incorporated into the motor gasoline demand forecast. The important aspect of our corn for ethanol use forecast hinges on a slow expansion of the E-10

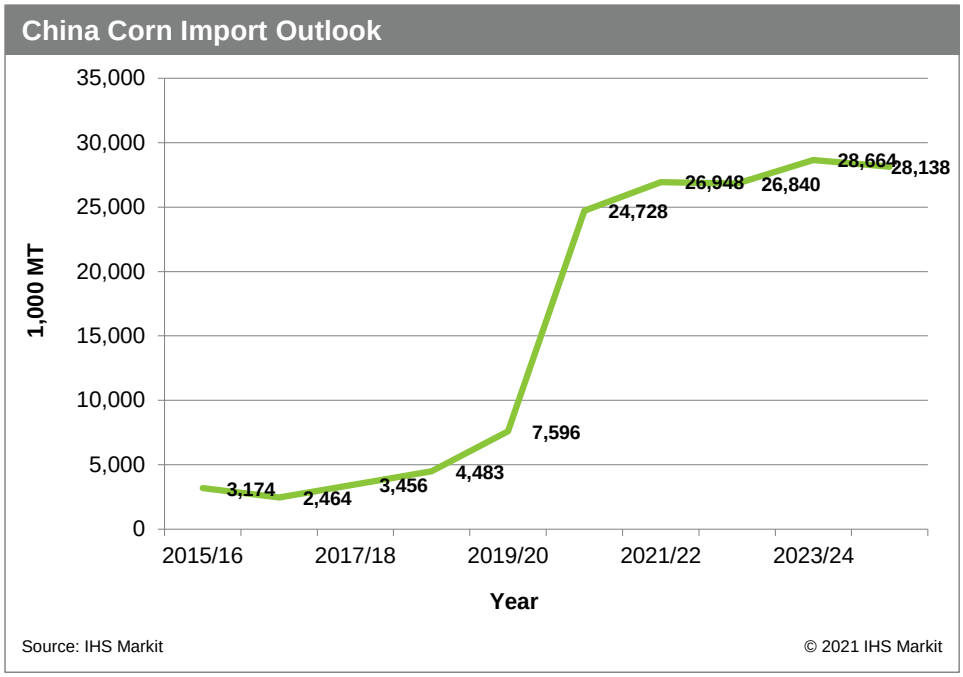
mandate to a blend rate closer to E-13 to offset the loss demand from a downward trend in motor gasoline use.

Like the explosive growth seen in soybeans, US corn exports have been the key factor in providing corn prices a story of their own beyond just soy. Our latest estimate is for US corn exports to increase from 1.78 billion bushels in 2019/20 to 2.9 billion bushels this season. The key behind this change is the strong appetite from mainland China. Even though our 2021/22 estimate weakens season over season, US exports will remain at a relatively large level of 2.52 billion bushels. As a result of the changes to both supply and export demand from November, our ending stock forecast has been tightened to 1.09 billion bushels. This is in stark contrast to our September 2020 forecast that indicated stocks of 2.8 billion bushels in 2020/21 and 3.3 billion bushels in 2021/22. The 2020/21 stocks-to-use ratio now stands at 7.3% versus its 10-year average of 11.8% but rises to 10.7% in 2021/22. The key take home point is that this stocks-to-use ratio in 2020/21 is right in line with the level seen in 2011/12 and 2012/13.

Price risk: With tighter carryover stocks in 2021/22 our corn price has been revised higher to $4.20 per bushel. From a risk standpoint there are a few different paths forward. The first is that prices peaked in February and decline into May. Another path is something like 2008 and prices rally into May. The bottom line is that most anticipate larger area this spring owing to price, the end user has their fingers crossed that farmers meet that area goal as the pipelines will be running tight, our demand forecast is heavily dependent on meeting export goals, and finally we are assuming average weather. For end users of corn, spring weakness will be an opportunity to reduce risk for the summer growing season but understand price may not top until May. A growing risk this summer will be sourcing physical supplies just prior to harvest given the stock situation. There could be areas in the United States that will be running a corn deficit and will be forced to tighten basis levels.

US Corn Fundamentals										
Marketing Year Beginning September 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Prices (Dollars Per Bushel)										
Season Average Farm Price	3.36	3.36	3.61	3.56	4.60	4.20	3.61	3.77	3.72	3.67
Central IL Spot Market Price	3.37	3.34	3.60	3.50	4.90	4.13	3.55	3.71	3.66	3.61
FOB, U.S. Gulf	3.95	4.07	4.29	3.93	5.07	4.63	3.98	4.16	4.10	4.04
Acreage (Million Acres)										
Planted Area	94.0	90.2	88.9	89.7	90.8	94.2	91.4	87.8	88.2	87.0
Harvested Area	86.7	82.7	81.3	81.3	82.5	86.5	83.9	80.5	80.9	79.8
Harvested Area % of Planted	92%	92%	91%	91%	91%	92%	92%	92%	92%	92%
Yield (Bushels Per Acre)	174.6	176.6	176.4	167.5	172.0	181.0	182.7	184.6	186.1	187.9
Supply (Million Bushels)										
Beginning Stocks	1,737	2,293	2,140	2,221	1,913	1,090	1,618	2,073	2,053	2,105
Production	15,148	14,609	14,340	13,620	14,182	15,658	15,333	14,866	15,063	14,990
Imports	57	36	28	42	25	30	25	25	25	25
Total Supply	16,942	16,939	16,509	15,883	16,120	16,777	16,976	16,965	17,141	17,120
Domestic Disappearance (Million Bushels)										
Feed & Residual	5,470	5,304	5,429	5,910	5,650	5,875	5,616	5,566	5,622	5,603
Fuel Alcohol (Ethanol)	5,432	5,605	5,378	4,852	5,052	5,350	5,317	5,299	5,371	5,346
HFCS	467	459	441	419	431	423	421	409	407	405
Seed	29	30	29	30	31	30	28	29	28	28
Food, Other	957	963	944	980	967	981	999	1,002	1,010	1,017
Total Domestic Disappearance	12,355	12,361	12,222	12,191	12,130	12,659	12,381	12,305	12,437	12,399
Exports (Million Bushels)	2,294	2,438	2,066	1,778	2,900	2,500	2,522	2,606	2,599	2,603
Total Disappearance (Million Bushels)	14,649	14,798	14,288	13,970	15,030	15,159	14,903	14,911	15,036	15,002
Ending Stocks (Million Bushels)	2,293	2,140	2,221	1,913	1,090	1,618	2,073	2,053	2,105	2,118
Source: IHS Markit									© 2021 IHS Markit	

US share of world exports is expected to hold steady in the forecast period partly due to potential increase in exports to China. China in recent years removed it support prices for corn production and that combined with growing feed demand in China is expected to increase China's imports of soybeans from 7.6 million tonnes in 2019/20 to over 28 million tonnes in 2025/26. However, Brazil is expected to increase its corn exports during the forecast period so export competition for the US will be strong.



Wheat

Supply: The late January IHS Markit planting survey showed all wheat plantings in 2021/22 will increase over 2020/21 to 45.3 million acres with winter wheat jumping to 32.0 million acres, durum rising slightly to 1.8 million acres while other spring declines to 11.5 million acres. With yields at 49.4 bushels per acre production will rise to 1.9 billion bushels, a season-over-season gain of 4.2%.

Demand: Food and industrial use for 2020/21 has been revised higher to 951 million bushels and feed and residual use increases 95 million bushels. With the supply issues in other major exports like Russia, we have revised our export forecast higher to 1.0 billion bushels. Ending stocks have been revised to 856 million bushels with a stocks-to-use ratio at 40.6%, which is below its 10-year average of 42.2%. Stocks tighten further to 789 million bushels in 2021/22 as weaker carryover stocks do not offset the small decline in total demand.

Price risk: The 2020/21 all wheat price has been increased to $5.75 per bushel and rises to $5.80 per bushel in 2021/22.

US Wheat Fundamentals										
Marketing Year Beginning June 1	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26
Prices (Dollars Per Bushel)										
Marketing Year Average Price	3.89	4.72	5.16	4.58	5.75	5.80	5.26	5.45	5.46	5.46
Acreage (Million Acres)										
Planted Area	50.1	46.0	47.8	45.5	44.3	45.3	44.9	43.6	43.9	44.0
Harvested Area	43.9	37.5	39.6	37.4	36.7	38.5	37.6	36.5	36.9	37.0
Harvested Area % of Planted	87%	82%	83%	82%	83%	85%	84%	84%	84%	84%
Yield (Bushels Per Acre)	53	46	48	51.7	50	49	50	50	51	51
Supply (Million Bushels)										
Beginning Stocks	976	1,181	1,099	1,080	1,028	856	789	802	775	775
Production	2,309	1,740	1,885	1,932	1,826	1,902	1,869	1,831	1,871	1,894
Imports	118	158	135	105	110	100	112	114	114	113
Total Supply	3,402	3,078	3,119	3,117	2,964	2,859	2,769	2,747	2,760	2,782
Domestic Disappearance										
Food and Industrial	949	964	954	962	951	960	970	970	976	981
Seed	61	63	59	60	62	70	68	68	69	69
Feed & Residual	161	46	88	101	95	90	117	94	84	85
Total Domestic Disappearance	1,171	1,073	1,102	1,123	1,108	1,120	1,154	1,132	1,128	1,136
Exports	1,051	906	937	965	1,000	950	813	839	856	868
Total Disappearance	2,222	1,979	2,039	2,089	2,108	2,070	1,968	1,972	1,985	2,003
Ending Stocks	1,181	1,099	1,080	1,028	856	789	802	775	775	779
Source: IHS Markit									© 2021 IHS Markit	

World wheat exports are expected to increase marginally during forecast period but still be below 2019/20 exports. US to face greater competition from EU exports which are likely to rebound sharply.

Cattle and Beef Sector

Total cattle and calves in the United States for 1 January 2021 held flat year on year (y/y) at 94.7 million head, a slight increase from the prior forecast, reinforced by stronger supply side activity in 2020. However, the peak of the cattle cycle has been called for some time, with previous estimations predicting inventories would peak in 2020. As placements started to recede in late 2020, the downward trend anticipated for cattle inventories in 2021 is to result in a 2.5% y/y decrease at the beginning of 2022 at 92.4 million head. Overall, this downward trend in inventories will extend throughout the next several years, with the 2025 cattle inventory expected to drop 7.1% from 2021 to 88.0 million head. US cattle slaughter in 2021 is to consequently measure 5.1% y/y higher, but then recede by 2.0% y/y in 2022. A majority of 2020 saw softening heifer slaughter, showing more retention and less liquidation relative to the initial months of 2020, helping contribute to the elevation of 2021. Total cattle slaughter in 2025 is forecast to decline by 7.5% compared with 2021, falling to 32.3 million head along the anticipated reductions over the next several years. Following along the overall downward trend in the supply side of the beef market, the calf crop will also shrink over the next few years. In 2021, the calf crop is projected to fall by 2.4% y/y to 34.9 million head, and in 2022 this decrease will be another 2.3% y/y. By 2025, the calf crop is to measure at 33.6 million head, a 3.9% loss from 2021. Beef cow slaughter will recede 2.1% y/y, in similar fashion to the rest of the market in 2021, while the decline is a further 3.0% y/y in 2022. Out to 2025, beef cow slaughter will fall 6.0% compared with 2021. Although carcass weights grew significantly in 2020 by 4.0% owing to COVID-19

impacts that kept cattle on feed for longer, this trend is to reverse and correct by a 2.7% y/y loss in 2021. However, along historical growth trends, cattle weights will grow overall in the longer term. Cattle weights in 2022 are to rise by 0.9% y/y, and 2025 measuring stronger than 2021 by 2.8%, highlighting modest and steady gains into the future. Beef production in total will hold flat y/y in 2021 at 27.5 million pounds, along this reduction trend. This light reduction trend in beef production will overall extend across the next several years, reaching 26.6 million pounds in 2025, a 3.5% reduction from 2021.

US Cattle Sector Fundamentals										
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Prices (Cents per Pound)										
1100 - 1300 #,										
5-area Direct Steers	120.89	121.90	117.07	117.15	107.67	109.54	111.15	115.04	117.71	119.01
Change	-18.6%	0.8%	-4.0%	0.1%	-8.1%	1.7%	1.5%	3.5%	2.3%	1.1%
600 - 650 #, Oklahoma										
City Feeder Steers	153.44	155.82	159.20	153.65	145.83	130.08	142.74	147.80	150.06	151.29
Change	-32.3%	1.5%	2.2%	-3.5%	-5.1%	-10.8%	9.7%	3.5%	1.5%	0.8%
Utility Cows, Sioux Falls	71.61	62.01	55.86	56.66	70.40	55.94	54.78	57.70	58.69	58.49
Change	-31.6%	-13.4%	-9.9%	1.4%	24.2%	-20.5%	-2.1%	5.3%	1.7%	-0.3%
Boxed Beef Cutout	206.77	209.90	213.97	222.62	238.93	220.64	222.10	226.73	230.47	232.45
Beef Retail (Dollars per pound)	5.96	5.91	5.92	6.04	6.38	6.25	6.01	6.14	6.24	6.28
Cattle Inventories as of January 1 (Million Head)										
Beef Cows (Jan. 1)	30.2	31.2	31.5	31.8	31.3	31.0	30.4	30.2	30.0	29.7
Dairy Cows (Jan. 1)	9.3	9.3	9.4	9.4	9.3	9.4	9.4	9.2	9.2	9.1
Cattle and Calves (Jan. 1)	91.9	93.7	94.3	94.8	94.4	94.7	92.4	90.0	88.8	88.0
Calf Crop	35.1	35.8	36.4	36.3	35.8	34.9	34.1	34.0	33.8	33.6
Calf Death Loss	2.1	2.1	2.2	2.3	2.2	2.2	2.1	2.1	2.1	2.0
Calf Slaughter	0.5	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.6	0.6
Beef Cow Slaughter	2.6	2.8	3.1	3.2	3.3	3.2	3.1	3.1	3.1	3.1
Dairy Cow Slaughter	2.9	3.0	3.2	3.3	3.1	3.5	3.5	3.4	3.4	3.4
Bull Slaughter	0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Steer and Heifer Slaughter	24.6	25.7	26.2	26.5	25.8	27.1	26.5	25.5	25.1	24.8
Total Slaughter	31.1	32.7	33.6	34.1	33.3	35.0	34.3	33.2	32.7	32.3
Cattle Imports	1.7	1.8	1.9	2.0	2.1	2.0	2.0	2.1	2.2	2.2
Cattle Exports	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Cattle Death Loss	2.3	2.4	2.4	2.5	2.4	2.4	2.4	2.3	2.3	2.3
Residual	0.0	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.1	-0.2	-0.2
Cattle and Calves (Dec. 31)	93.1	93.7	94.2	93.8	94.1	91.7	89.4	88.2	87.4	86.6
Cattle on Feed	13.2	13.1	14.1	14.4	14.7	14.7	14.7	14.0	13.6	13.4
Beef Supply (Million Pounds)										
Beginning Stocks	683	757	649	664	610	592	623	632	616	611
Imports	3,015	2,993	2,999	3,057	3,343	3,615	3,003	2,820	2,775	2,833
Production	25,221	26,228	26,867	27,148	27,469	27,546	27,750	27,049	26,725	26,585
Total	28,919	29,978	30,515	30,870	31,422	31,753	31,376	30,501	30,116	30,029
Beef Disappearance (Million Pounds)										
Domestic Use	25,673	26,371	26,665	27,167	27,867	28,414	27,797	27,175	26,862	26,796
Exports	2,556	2,860	3,155	3,022	2,958	3,088	2,947	2,710	2,643	2,623
Total	28,229	29,231	29,820	30,189	30,824	31,503	30,743	29,885	29,505	29,419
Ending Stocks	757	649	664	610	592	623	632	616	611	610
Per Capita Consumption (Pounds)										
Carcass Weight	79.2	80.8	81.1	82.3	84.6	86.0	83.9	81.6	80.2	79.6
Retail Weight	53.0	54.1	54.4	55.2	56.7	55.6	56.3	54.7	53.8	53.4
Change	2.9%	2.0%	0.7%	1.4%	2.7%	-2.1%	1.3%	-2.7%	-1.7%	-0.8%

Source: IHS Markit

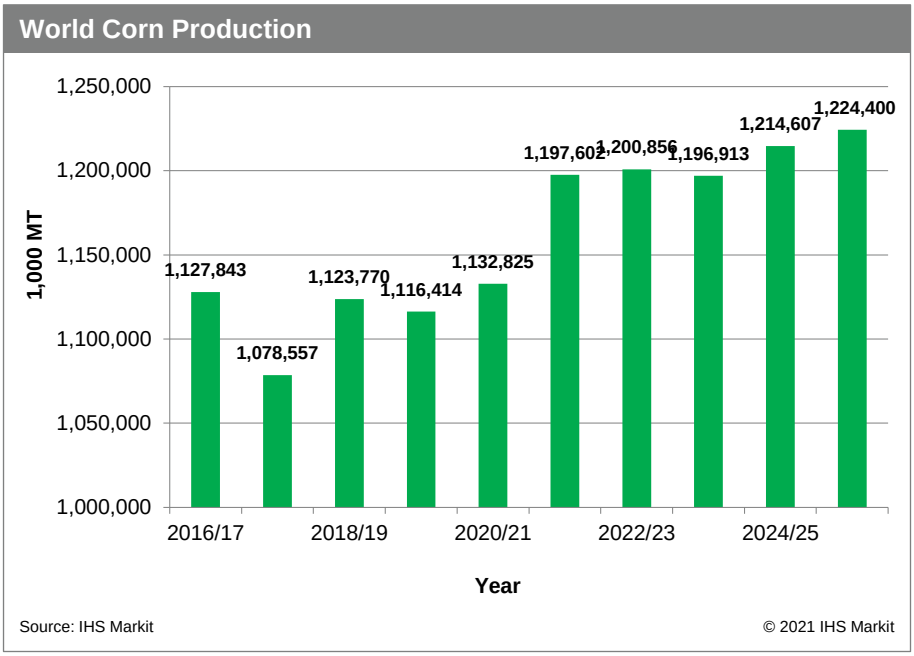
Beef prices in 2021 will see a notable retraction, returning prices closer to average values observed in 2019, following the massive COVID-19 supply shutdown impacts in 2020 that had prices spiking to substantial record values. However, with beef prices back down to normal levels as of July 2020, values in 2021 will remain along this level, as well. Across recent months, reemerging talks on slaughter facility hurdles and potential quarantines have shone the light on possible price swings. While prices have shifted outside of prior expectations at times more recently, the moves have not been nearly as sharp as early COVID-19 impacts, and have been quickly correcting back down to more suppressed values. Beef prices are projected to average at $220.6 per hundredweight (cwt) in 2021, a 7.7% y/y decline, although this follows the 7.3% y/y jump that occurred in 2020. Beef prices will overall climb modestly into the future, as overall supply and demand will lightly decline together. In 2022, the boxed beef cutout is to rise by 0.7% y/y to $222.1 per cwt. Further out over the next few years, prices will rise to $232.5 per cwt in 2025, a 5.3% gain over the price expected for 2021.

ND Cattle ranchers are slowly rebuilding their herd Inventory of all cattle and calves as of January 1, 2020 totaled 1.90 million head, up 4% from a year ago. Cash receipts from ND cattle marketings totaled $983 million in 2019, down 5% from the previous year's marketings.

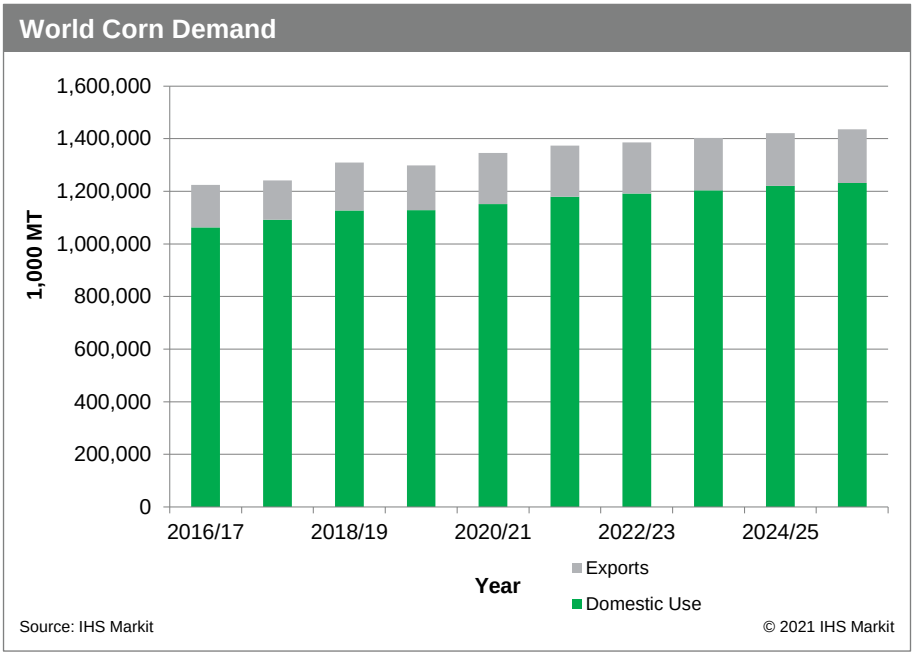
Global Outlook and Assumptions

Corn

Supply: Global corn production is forecast at 1.13 billion metric tonnes in 2020/21, up about 2% from the previous year based primarily on expected larger US production. World corn production is projected to continue to grow through 2025/26 reaching a record 1.22 billion MT. The largest production increases are forecast for Brazil (to increase by about 12 MMT) and Ukraine (to increase by about 8 MMT during the forecast period increasing export competition for the US.

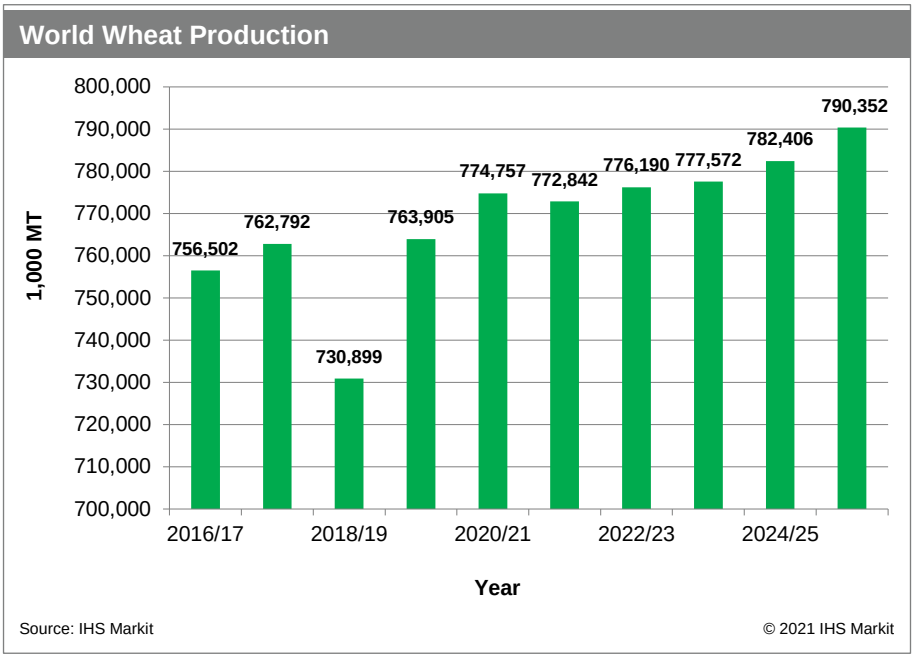


Demand: World corn imports are forecast to increase by 15 MMT in 2021/22. World corn imports are forecast to increase about 20 MMT from 2021/22 to 2025/26 mainly because of expected higher imports by China. This large increase in imports bodes well for exporting countries such as the US. As a result, US exports could increase by about 10 MMT, Brazil's exports by about 6 MMT and Ukraine's by 3 MMT during the forecast period.

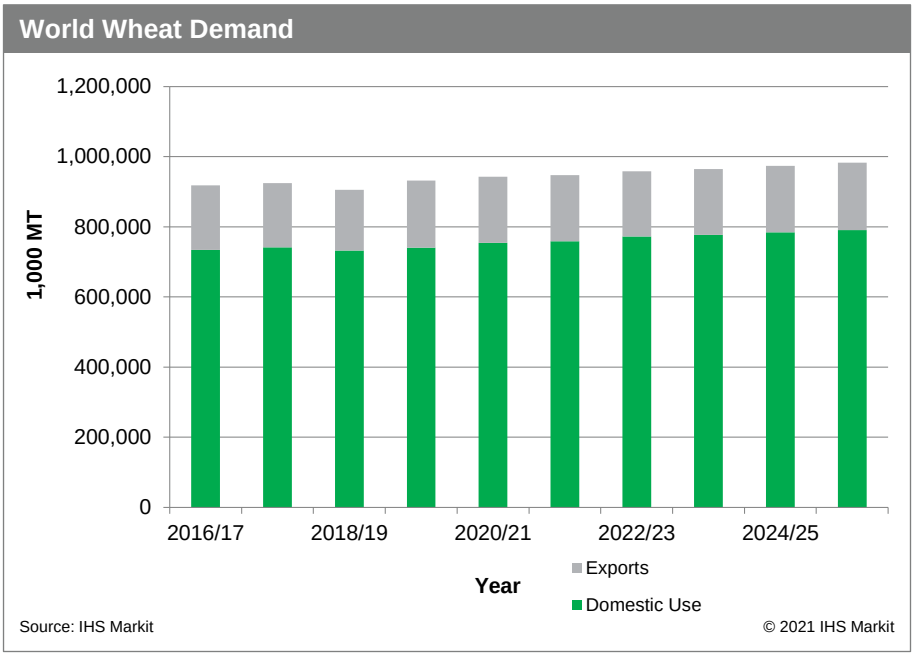


World Wheat

Supply: World wheat production is forecast at 774.8 MMT in 2020/21, up only 1% from the previous year. World wheat production is projected to continue to grow through 2025/26 reaching a record 790 MMT. The largest production increases are forecast for the EU which could increase over 16 MMT during the forecast period. US production during the forecast period is forecast to increase by about 2 MMT.



Demand: World wheat imports are forecast to increase by over 5 MMT in 2020/21. But world wheat imports are forecast to increase by about 14 MMT from 2021/22 to 2025/26 mainly. Africa is expected to account for at least half the increase in world wheat imports during the forecast period. This larger increase in imports bodes well for exporting countries. Russia and Ukraine are expected to gain the lion's share of the increase in wheat exports during the forecast period. US exports are expected to remain relatively flat.

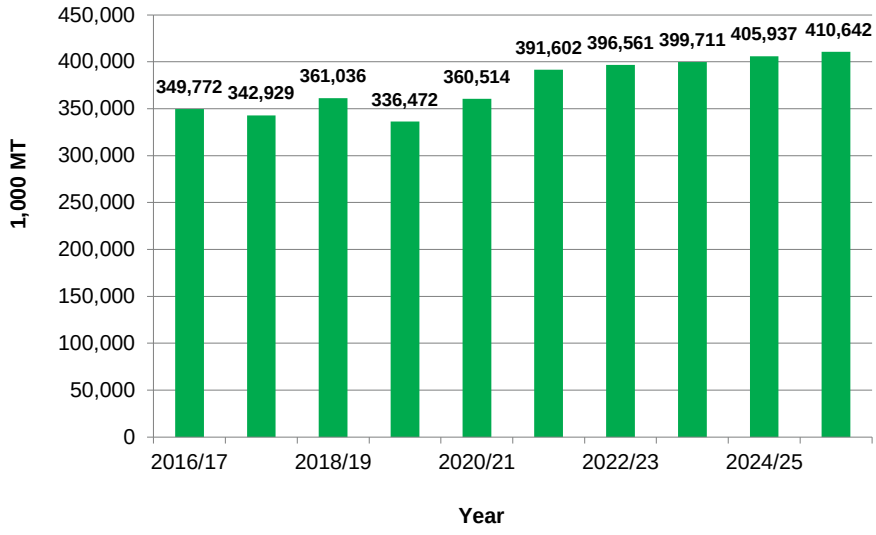


Soybeans

Supply: World soybean production is forecast at 373.2 MMT in 2020/21, up 9% from the previous year based mainly on a rebound in US production. World soybean production is projected to continue to grow through 2025/26 reaching a record 394 MMT. The largest production increases are forecast for Brazil and Argentina which combined could increase over 18 MMT during the forecast period. US production during the forecast period is forecast to down slightly.

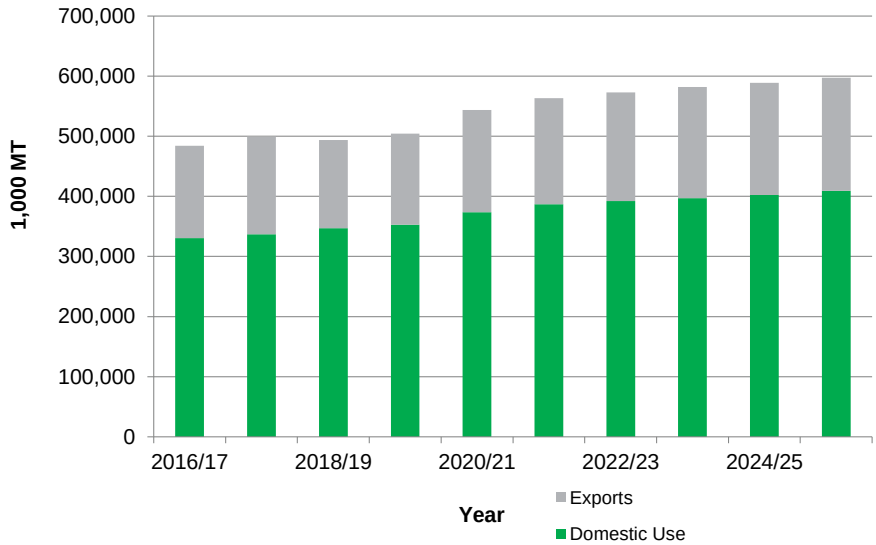
Demand: World soybean imports are forecast to increase by over 5 MMT in 2020/21 with China accounting for most of that increase. World soybean imports are forecast to increase by about 14 MMT from 2021/22 to 2025/26 mainly because of expected increased by China. This larger increase in imports bodes well for exporting countries such as the US, Brazil and Argentina.

World Soybean Production



Source: IHS Markit

World Soybean Demand



Source: IHS Markit

Farm Policy Issues

Climate and Conservation Policy

President Biden indicates climate change will be a major focus of his Administration. There is interest in establishing and expanding programs to encourage farmers, ranchers, and landowners to adapt farm management practices that scientists believe can help draw down atmospheric carbon and they can sell those carbon credits. The management practices could include conservation tillage, planting cover crops, reforestation, and using methane digesters for livestock operations.

The USDA may also use the government-owned Commodity Credit Corporation to create a federal "carbon bank" that would offer credits for the carbon sequestered by sustainable management practices. However, it has not yet been determined whether CCC can be used. Suggestions are that $1 billion could be allocated to purchase carbon credits at $20 per ton, which could reduce greenhouse gas emissions by 50 megatons every year.

China and Phase 1 Commitments

At this time, President Biden does not appear likely to change the agreement in terms of impacting imports. It is not clear if the structural market access changes made by China to increase imports will be discussed or changed. For example, the number of meat plants that can export to China increased from 1500 to 4000.

WOTUS

The Trump administration Navigable Water Protection Rule is now in effect across the US in the wake of a recent federal appeals court reversing a lower court ruling that had blocked it from taking effect in Colorado. The Tenth Circuit Court of Appeals ruled that the Colorado ruling was in error as it did not agree that there would be irreparable harm if the rule were to take effect.

The Biden Administration is reviewing the rule and then will decide if and what wants changes are needed. Then, depending on the changes, there will be legal challenges which will take time.

Infrastructure

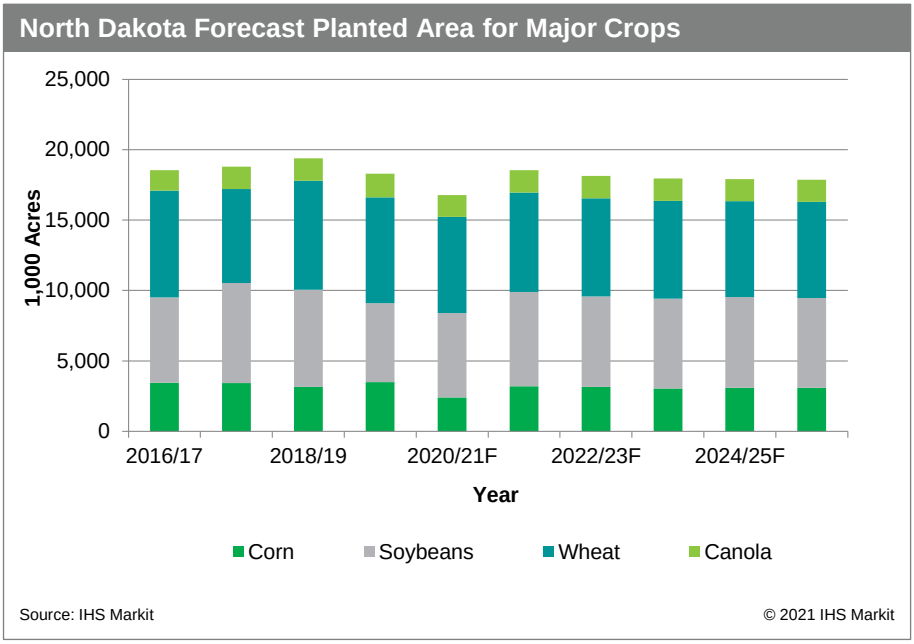
Infrastructure legislation maybe the only issue where there could be bi-partisan agreement in Congress.

Farm Bill 2023

Not too early to start thinking about because work on the Farm Bill will gain steam once it starts.

North Dakota Outlook

North Dakota planted area for corn, wheat, and canola in 2020/21 was reduced by a combined 1.5 million acres for corn wheat and canola as weather events prevented some planting. Soybeans was the only major crop that increased marginally in 2020/21. Normal planting conditions for 2021/22 should allow for the combined area for these four crops to increase by 1.77 million acres and exceed 2019 plantings. But plantings are forecast to decrease slowly through the rest of the forecast period following somewhat US prospects for these same crops.



North Dakota soybean area declined from 7.1 million acres in 2017 to 5.6 million acres in 2019. Area though increased to 5.75 million acres in 2020 and is likely to follow the US area forecast based on higher prices.

US canola planted area was down 188,000 acres from 2019/20 to 2020/21 due to prevent plant. Area is expected to rebound in 2021/22 and be relatively flat through the rest of the forecast period. US farm canola prices are expected to range between 15 cents per pound to 17 cents during the forecast period. The North Dakota canola acreage in 2020/21 was down by 250,000 acres in 2020/21. As a result, ND production was down 7% in 2020/21. But area and production is expected to rebound in 2021/22 and follow the US trend for the rest of the forecast period.

North Dakota is the top wheat producing state followed by Kansas. The 2020 North Dakota wheat crop was down 3% from the previous year based on smaller area. North Dakota wheat plantings are forecast to follow the US trend during the forecast period.

North Dakota sugar beet production in 2020/21 was 5.4 million tons, up 1.0 million tons from the previous year weather reduced harvest based on improved yields. North Dakota is the number three sugar beet producing state. The number one producing state is Minnesota.

North Dakota is the top producer of dry edible beans in the US, typically accounting for 25% or more of total production. Total production for the state in 2020 came in at 14.6 million CWT based on higher yields and nearly double the weather reduced harvest in 2019.

Changing Farm Structure: US and North Dakota

The agricultural landscape continues to change rapidly. Farming continues to become more high-tech; the largest operations are getting bigger and the smaller operations are carving out their own niche markets. The farm sector continues to become more concentrated and commercial operations, many on a very large scale, are becoming more dominant. At the other end of the scale some small farmers are becoming more specialized such as in organic production or other niche products supplemented by greater non-farm income.

Total US harvested cropland has steadily increased, up 17.3 million acres from 2002 to 2017. But only farms with 2,000 acres or more and farms with less than 10 acres have increased their share of total harvested cropland area. Larger farms are changing the value chain. The larger farms can take advantage of economies of scale. Bigger farms are in a position to get better deals on inputs because of their size or hold product off the market to wait for better prices. They are also more diversified, growing different crops.

US: Change in Number of Cropland Acres by Farm Size

Item	2002	2007	2012	2017	Chng 2002-2017
Under 10 Acres	249,242	291,828	285,875	360,990	111,748
10 to 49 Acres	4,111,751	4,296,973	4,115,755	4,068,888	-42,863
50 to 69 Acres	2,468,654	2,451,606	2,457,020	2,183,352	-285,302
70 to 99 Acres	4,649,652	4,500,846	4,415,577	3,925,972	-723,680
100 to 139 Acres	6,114,934	5,775,871	5,737,126	5,181,887	-933,047
140 to 179 Acres	7,273,320	6,590,706	6,341,110	5,803,430	-1,469,890
180 to 219 Acres	6,217,966	5,588,532	5,610,170	5,008,450	-1,209,516
220 to 259 Acres	6,455,901	5,730,418	5,523,418	5,014,346	-1,441,555
260 to 499 Acres	34,088,945	30,444,392	28,780,760	26,950,862	-7,138,083
500 to 999 Acres	56,659,861	51,556,447	49,471,560	45,887,053	-10,772,808
1,000 to 1,999 Acres	72,787,584	69,844,694	68,663,555	66,222,703	-6,564,881
2,000 or more Acres	101,619,442	122,535,288	133,562,674	149,433,925	47,814,483
Total	**302,697,252**	**309,607,601**	**314,964,600**	**320,041,858**	17,344,606

Source: IHS Markit

North Dakota is following the same trends in consolidation as the US but at a bigger scale. North Dakota's largest farms with 2,000 acres or more have increased their share of harvested cropland from increased their share of total cropland from 59% in 2002 to 75% in 2017 while the largest US farms increased their share of harvested cropland from increased their share of total cropland from 34% in 2002 to 47% in 2017.

North Dakota: Change in Number of Cropland Acres by Farm Size					
Item	**2002**	**2007**	**2012**	**2017**	**Chng 2002-2017**
1 to Acres	345	476	461	889	544
10 to 49 Acres	31,924	37,058	39,602	36,985	5,061
50 to 69 Acres	29,084	29,764	37,287	26,040	-3,044
70 to 99 Acres	66,081	77,635	79,283	60,538	-5,543
100 to 139 Acres	95,827	107,257	103,923	79,621	-16,206
140 to 179 Acres	271,739	311,509	302,564	218,351	-53,388
180 to 219 Acres	114,659	125,983	120,373	92,153	-22,506
220 to 259 Acres	135,453	165,645	137,258	104,174	-31,279
260 to 499 Acres	1,114,352	1,238,939	977,865	783,282	-331,070
500 to 999 Acres	2,553,071	2,394,008	1,971,167	1,549,416	-1,003,655
1,000 to 1,999 Acres	6,348,159	5,650,208	4,500,189	3,976,361	-2,371,798
2,000 or more Acres	15,745,783	17,388,698	18,877,268	21,023,866	5,278,083
Total	**26,506,477**	**27,527,180**	**27,147,240**	**27,951,676**	**1,445,199**

Source: IHS Markit

IV. Deep Dive into the Tax Streams

To forecast the tax revenues for North Dakota, IHS has developed custom econometric models for major sources of state tax revenue.

- The forecasted amounts are based on quarterly data with quarterly economic drivers associated with the underlying economic activity. The economic drivers were carefully selected after reviewing historical data and comparing economic data to the tax collections.
- Quarterly forecast are aggregated into fiscal year totals and biennial totals.
- The forecast amounts were be updated in March to reflect the most current information available for the economic outlook.

March 2021 Final Forecasts

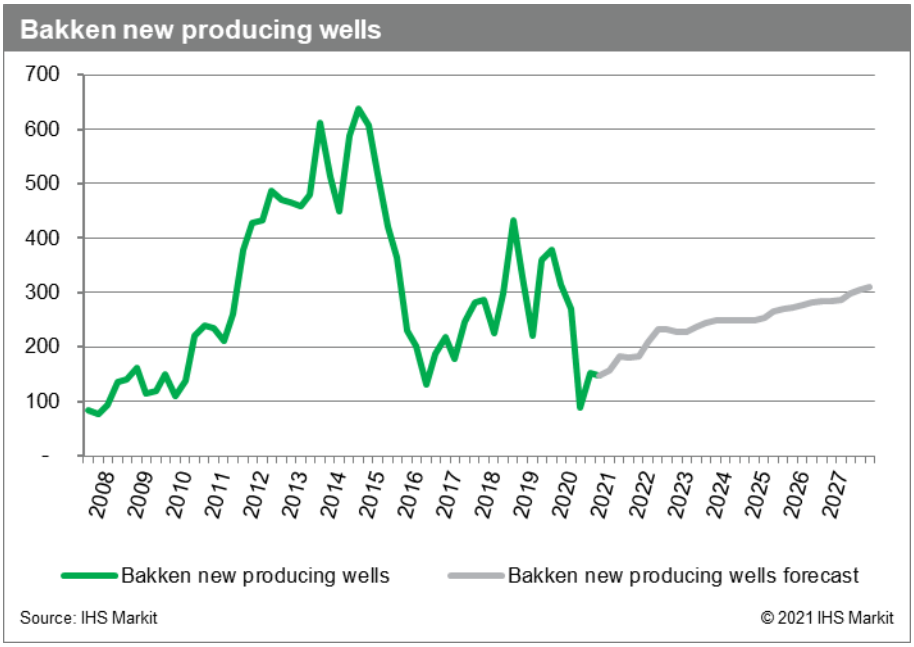
Revenue Source	2017-19 Biennium Actual	2019-21 Biennium Forecast (Original)	2019-21 Biennium Forecast	2021-23 Biennium Forecast
Sales and use tax	**1,786,479,717**	**1,868,262,000** ***4.6%***	**1,779,129,718** ***-0.4%***	**1,795,249,810** ***0.9%***
Motor vehicle excise tax	**239,039,038**	**249,951,800** ***4.6%***	**244,275,345** ***2.2%***	**260,940,310** ***6.8%***
Individual income tax				
Total individual income tax collections	961,072,888		1,034,478,144 *7.6%*	1,059,247,861 *2.4%*
Transfer to refund reserve accounts	(183,000,000)		(249,800,000)	(251,000,000)
Net individual income tax collections	**778,072,888**	**803,305,000** ***3.2%***	**784,678,144** ***0.8%***	**808,247,861** ***3.0%***
Corporate income tax				
Total corporate income tax collections	299,456,537		272,125,376 *-9.1%*	277,944,529 *2.1%*
Transfer to refund reserve accounts	(58,000,000)		(64,000,000)	(75,000,000)
Net corporate income tax collections	**241,456,537**	**132,268,000** ***-45.2%***	**208,125,376** ***-13.8%***	**202,944,529** ***-2.5%***

Note: The percentages in the table reflect the change from the prior biennium

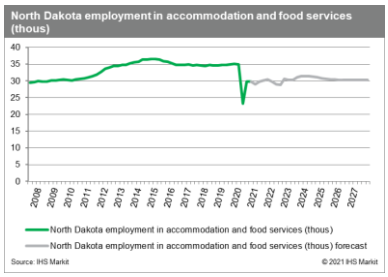
The specific market drivers and concept behind each of the forecasted tax steams are provided in detail below.

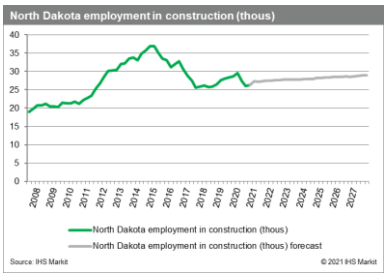
Sales and use tax

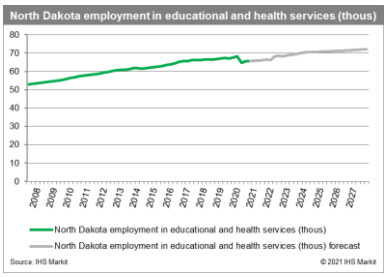
- To forecast the sales and use tax revenue, each taxable sales sector is modeled and a forecast is produced. The sector forecasts are summed to a total taxable sales forecast. The tax rate is applied to the total taxable sales forecast to calculate sales and use tax revenue.
- Of the fifteen taxable sales sectors, nine sectors have a strong correlation with energy markets, thus (1) new producing wells is used as the driver in these equations. The nine sectors are accommodation and food services, construction, financial services, manufaturing, mining and oil, miscellaneous, other services, transportation and warehousing, and wholesale trade. In 2020, new producing wells plummeted as a consequence of COVID-19 shutdowns and the oil price war from Russia and Saudi Arabia. With the vaccine rollout and production cuts by Saudi Arabia, the well count will increase in 2021. The acceleration of new producing wells will continue through 2022, then grow at a slower pace through the end of the forecast period.

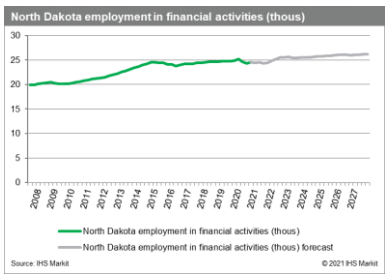


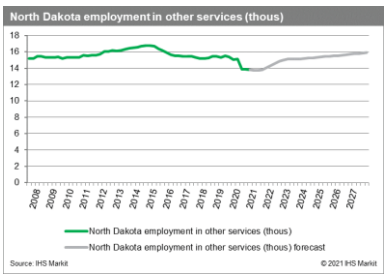
- Another driver used in some of the sector-level equations is (2) employment in North Dakota by sector and can be found in the models for accommodations and food services, construction, education, health care, and social services, financial services, other services, professional services, arts and recreation, transportation and warehousing, and wholesale trade.
- Employment in many sectors experienced positive growth in the fourth quarter of 2020. The transportation and warehousing sector had the largest quarter-over-quarter increase from its 2020Q3 levels. The arts, entertainment, and recreation sector has the most substantial decline from the previous quarter. By the middle of 2022, employment in most sectors will return to pre-pandemic levels, with the exception of the construction sector and accommodation and food services sector.

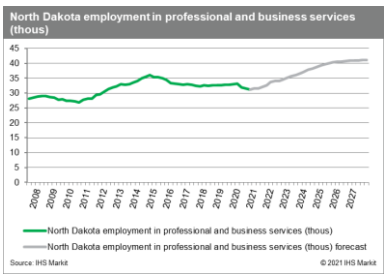


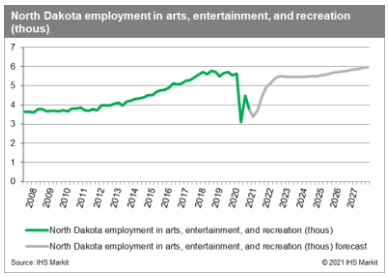


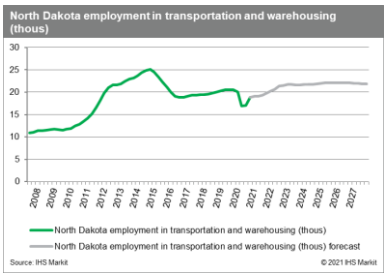


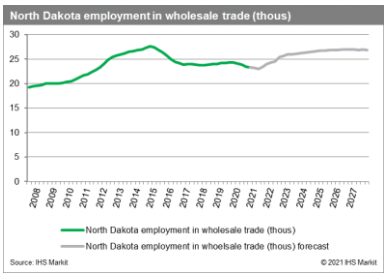




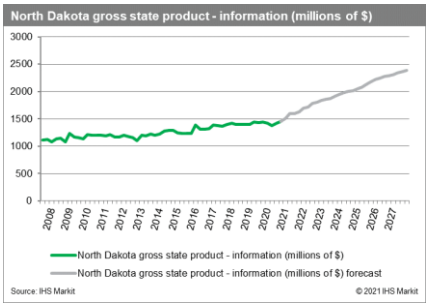


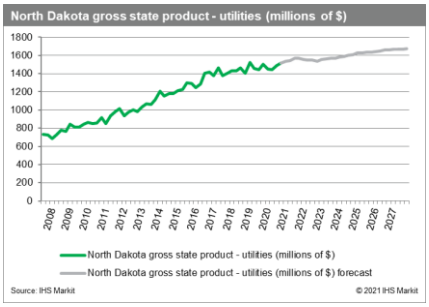




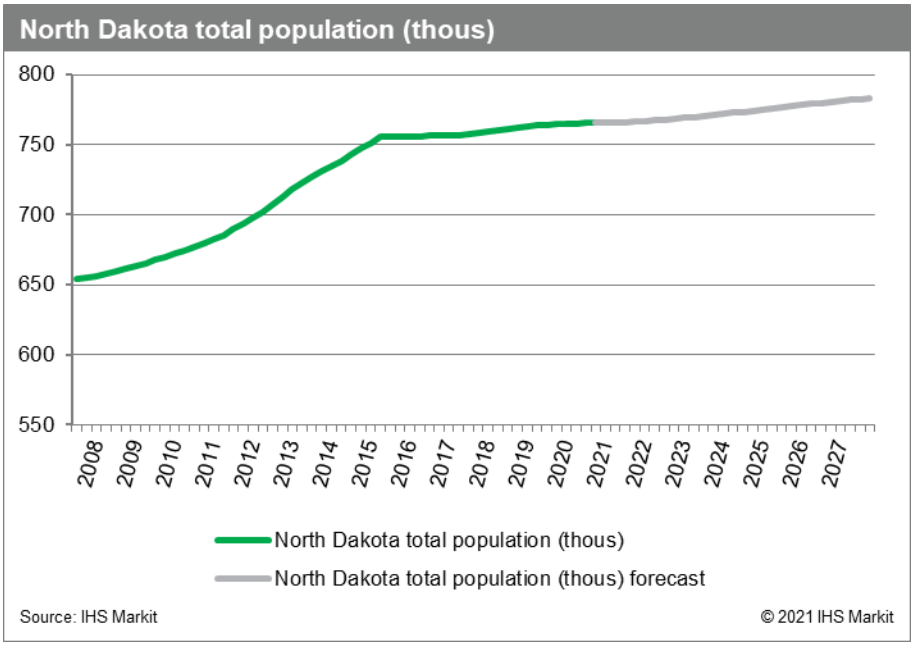


> (3) Gross state product in North Dakota by sector captures changes in the variations in taxable sales in information industries and utilities. Both the gross state product for information and utilities reached pre-pandemic levels by the fourth quarter of 2020. Growth for information gross state product accelerates through the forecast horizon. On average, the year-over-year growth of information gross state product in 7.5%. For the gross state product in utilities, growth is more modest with the average year-over-year growth in the forecast horizon at 1.8%.

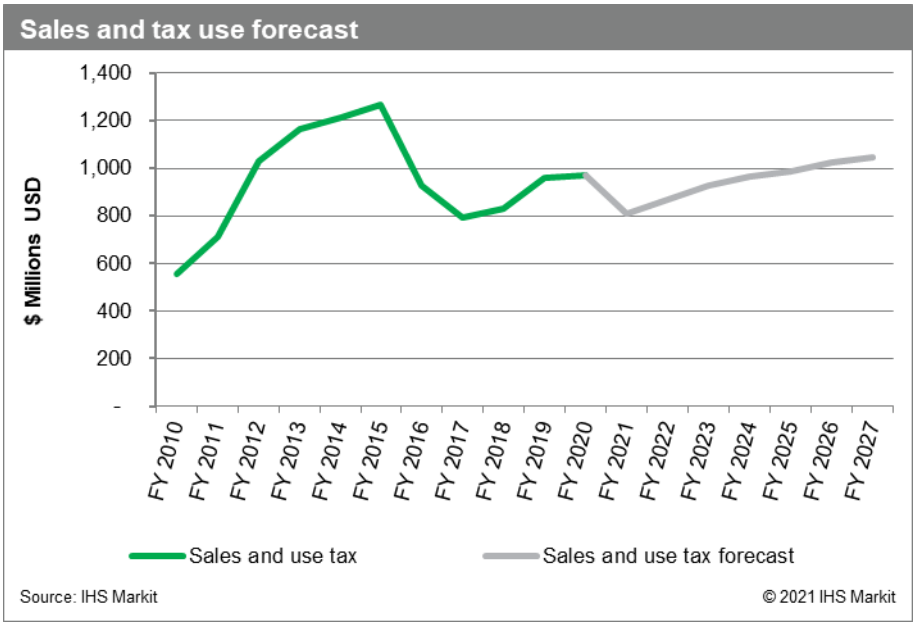




> The taxable sales in retail trade is driven solely by (4) population in North Dakota. IHSM assumes per-capita purchases are stable, even through the pandemic.

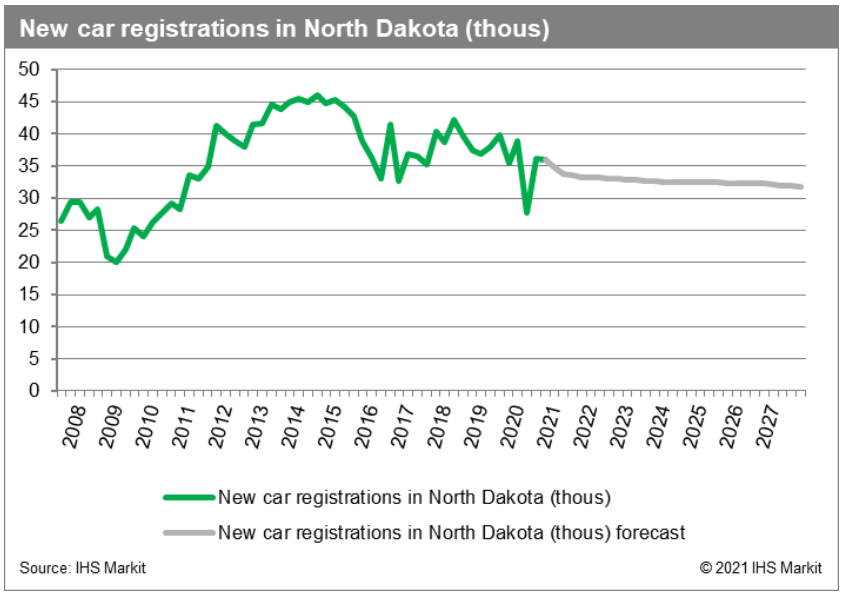


> After summing the sector-level taxable sales to a total and applying the 5% tax rate and 91.3% for transfer to the general fund, IHSM forecasts a 16.7% decline in sales and use tax in FY 2021, followed by growth of 7.2% in FY 2022 and 7.1% in FY 2023.

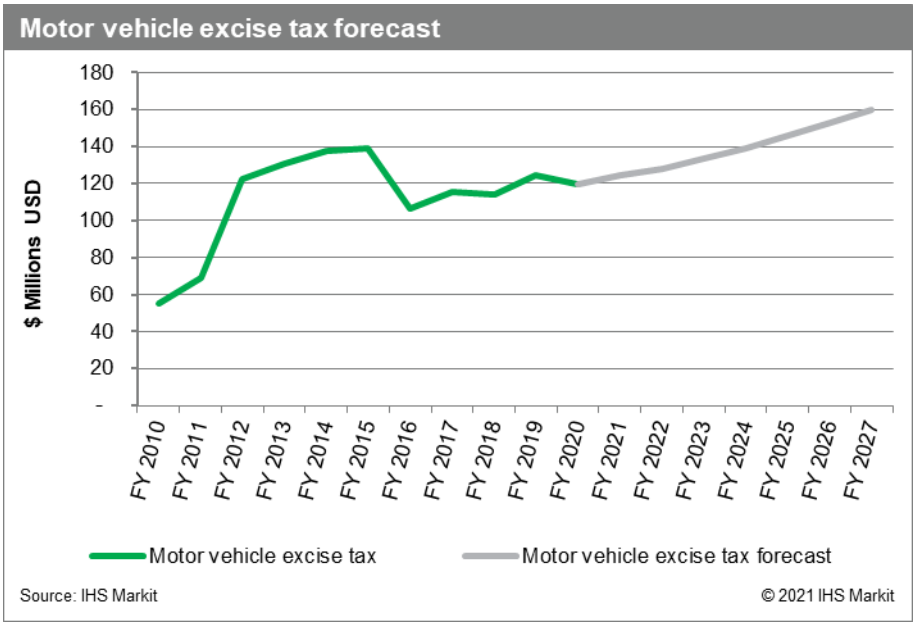


Motor vehicle excise tax

> The main driver of motor vehicle excise tax is (1) new passenger and light truck registrations for the state. New car registrations have declined since the peak in 2014 and dropped siginifantly in the second quarter of 2020 from waves of shutdowns affecting vehicle manufacturers and nonessential businesses. Though registrations jumped in the the second half of 2020, they still remained 7.5% below pre-pandemic levels. New car registrations will gradually decline through the end of the forecast horizon.

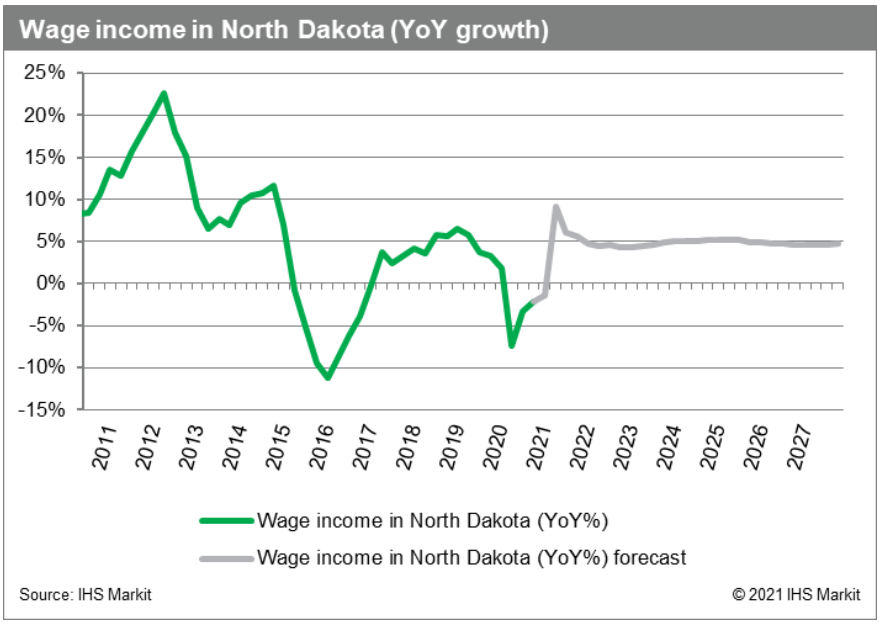


> Resulting from the more positive new care registrations forecast, IHSM expects motor vehicle tax to grow by 4.4% in FY 2021, 2.3% in FY 2022, and 4.4% in FY 2023.

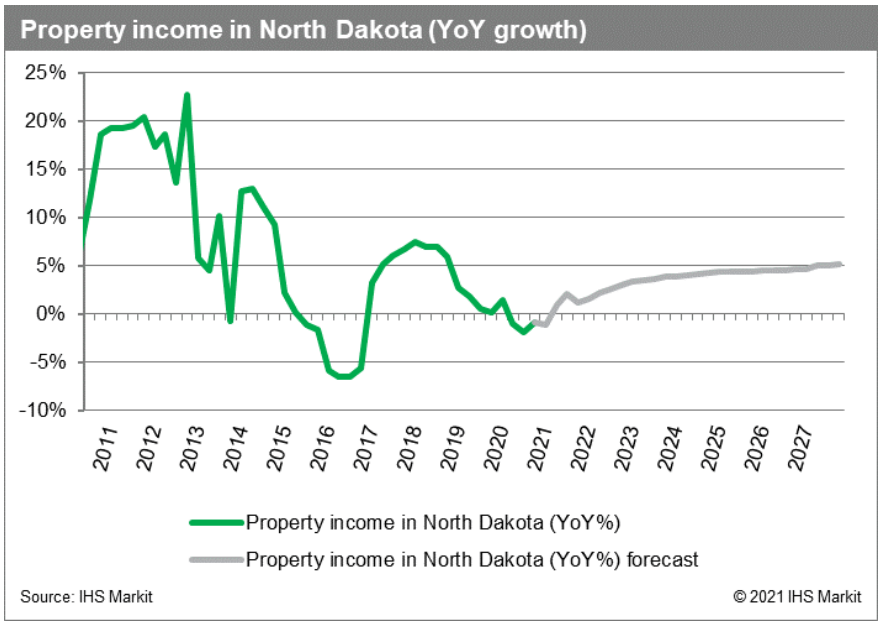


Individual income tax

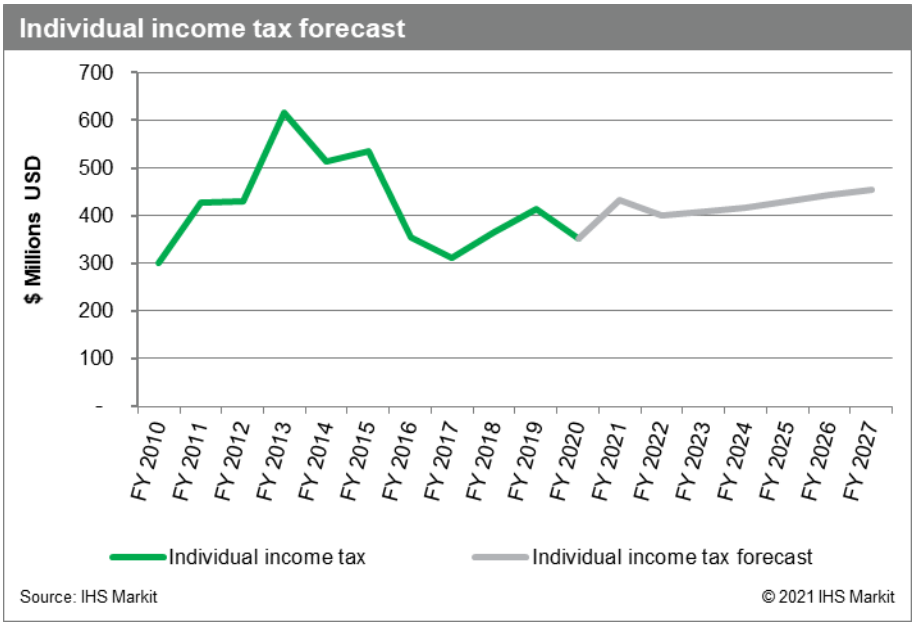
- To model and forecast individual income tax revenues, IHSM built separate models for individual income tax submitted as withholdings versus as estimated payments.
- Our model for individual income tax submitted as withholdings has a single driver: (1) total wage income in North Dakota. As income withholding is relatively stable and largely driven by total wage income in the state, the elasticity of income withholding with respect to total income is approximately one. This means that one percent growth of wage income will translate to one percent of withholding. After a spike in the middle of 2021, wage income falls back to the 5% growth range. Therefore, IHSM expects individual income submitted as withholding to grow around 5% by 2022 through the end of the forecast horizon.



- The tax base of individual income tax submitted as estimated payments, on the other hand, is more volatile due to the nature of capital gains realization. That being said, a reasonable amount of variations in the tax base of individual income estimated payments is captured by changes in the (1) state's property income, i.e., personal rental income, personal dividend income, and personal interest income. State property income is the single driver for individual income tax submitted as estimated payments.

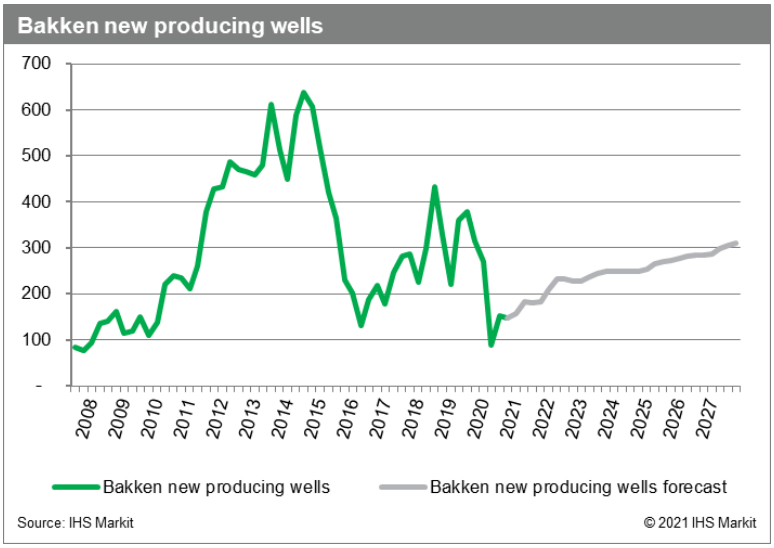


- Insight about the estimated transfer to reserve fund accounts was provided by NDLM. About 23.7% rounded to the nearest million of the gross individual income tax revenue at the annual level is transferred to the reserve fund account. The percentage is based on the average of the past five years.
- In total, IHSM expects net individual income tax collections to grow at 22.9% in FY 2021, followed by -7.3% in FY 2022 and 1.5% in FY 2023.
- The big volatility in gross individual income tax collections in FY 2020, FY 2021 and FY 2022 reflects the filing and payment extension from April 2020 to July 2020. It is estimated that the annual changes of gross income tax collection would be 3.2%, 0.3%, 2% in FY 2020, FY 2021 and FY 2022 respectively barring the impacts of the extension.

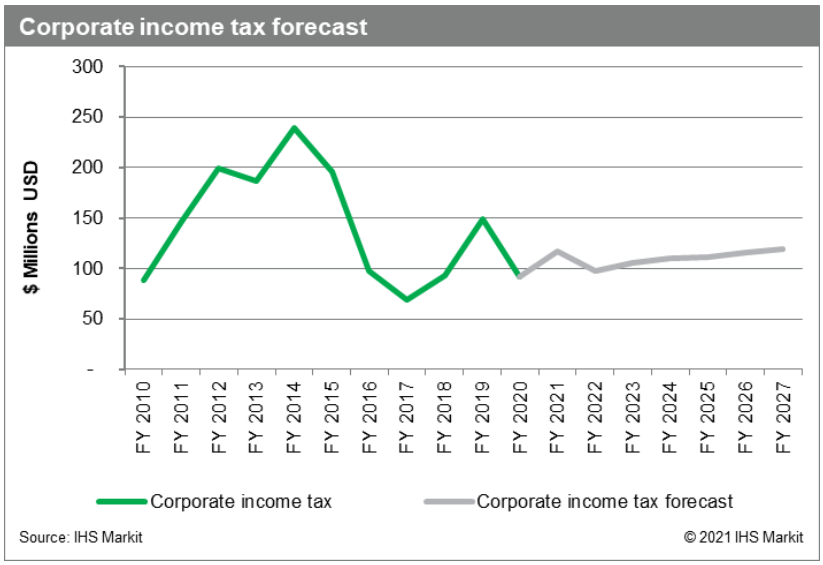


Corporate income tax

- Gross corporate income tax collections are affected by (1) new producing wells in the Bakken play as an indicator of the well-being of oil companies. After increasing from the low in the second quarter of 2016, the new well count started to drop at the end of 2019 and hit levels not seen since 2008 by the second quarter of 2020. In 2021, well counts rise as the COVID-19 vaccine is rolled out. Though not as fast as 2021, the number of new producing wells grow through the forecast horizon.



- Insight about the estimated transfer to reserve fund accounts was provided by NDLM. About 26.8% rounded to the nearest million of the gross corporate income tax revenue at the annual level is transferred to the reserve fund account. The percentage is based on the average of the past five years.
- The IHSM forecast for net corporate income tax collections is 27.1% growth in FY 2021 followed by a 16.0% decline in FY 2022 and a 7.3% growth in FY 2023.



V. Scenarios

Given the significant fiscal impacts of oil price variations in North Dakota, IHSM customizes high/low scenarios. The Optimistic scenario assumes demand growth is stronger than in the Baseline. The Pessimistic scenario assumes that new COVID-19 cases remain high and demand continue to be weak. IHSM then runs the model under each scenario to create forecast for major revenue streams.

Revenue Source	2019-21 Biennium Baseline	2019-21 Biennium Optimistic	2019-21 Biennium Pessimistic
Sales and use tax	1,779,129,718 *-0.4%*	1,799,519,085 *0.7%*	1,760,059,613 *-1.5%*
Motor vehicle excise tax	244,275,345 *2.2%*	244,737,333 *2.4%*	243,510,876 *1.9%*
Net individual income tax	784,678,144 *0.8%*	787,200,855 *1.2%*	780,848,566 *0.4%*
Net corporate income tax	208,125,376 *-13.8%*	212,917,229 *-11.8%*	204,704,966 *-15.2%*

Revenue Source	2021-23 Biennium Baseline	2021-23 Biennium Optimistic	2021-23 Biennium Pessimistic
Sales and use tax	1,795,249,810 *0.9%*	1,880,238,002 *4.5%*	1,682,844,338 *-4.4%*
Motor vehicle excise tax	260,940,310 *6.8%*	268,159,108 *9.6%*	256,423,137 *5.3%*
Net individual income tax	808,247,861 *3.0%*	830,978,304 *5.6%*	784,825,060 *0.5%*
Net corporate income tax	202,944,529 *-2.5%*	221,277,843 *3.9%*	181,014,880 *-11.6%*

Note: The percentages in the table reflect the change from the prior biennium

V. Disclosures

The forecasts included in this report, including, but not limited to, those regarding tax revenues, are estimates, which have been prepared on the basis of certain assumptions and hypotheses. No representation or warranty of any kind is or can be made with respect to the accuracy or completeness of, and no representation or warranty should be inferred from, these forecasts. The tax revenue forecast contained in this report is based upon assumptions as to future events and, accordingly, is subject to varying degrees of uncertainty. Some assumptions inevitably will not materialize and, additionally, unanticipated events and circumstances may occur. Therefore, for example, actual tax revenues inevitably will vary from the forecasts included in this report and the variations may be material and adverse.